PB-229 574

AESTHETICS IN ENVIRONMENTAL PLANNING

Martin J. Redding

Stanford Research Institute

Prepared for:

Environmental Protection Agency

November 1973

DISTRIBUTED BY:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

SELECTED WATER RESOURCES ABSTRACTS

INPUT TRANSACTION FORM

1. Report No.

PB 229 574

W 74-04987

4. Title

AESTHETICS IN ENVIRONMENTAL PLANNING,

5. Report Date

6.

8. Performing Organization Report No.

7. Author(s)

10. Project No.

1HA098

EPA Program Element

9. Organization

Stanford Research Institute, Menlo Park, California, Operations Evaluation Department

11. Contract/Grant No.

13. Type of Report and Period Covered

12. Sponsoring Organization

15. Supplementary Notes--Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-73-009, November 1973. 187p, 6 fig, 4 tab, 217 ref.

16. Abstract

Three primary aspects of the aesthetic concept are discussed: aesthetics and the human senses, aesthetics as thinking about the arts, and aesthetics as the science of beauty. Additional factors underlying the concept of aesthetics include: nature as an underlying force; cultural, social and economic phenomena as determiners of aesthetic expression; and aesthetics of American city life. Aesthetics is also discussed in the context of the National Environmental Policy Act. The following research projects are suggested: (1) Development of criteria for evaluating methodologies designed to assess aesthetic impacts--special emphasis on objectivity, secondary impacts, and aesthetics as an interrelated aspect of all environmental elements. (2) Increased emphasis on user preference studies for understanding individual attitudes and group values about aesthetic characteristics in the environment. (3) Development of aesthetic quality indicators for different levels of concern (national, state-regional, community-local) and devise monitoring techniques. (4) Development of methods for communicating aesthetic effects of changes resulting from planned activities--simulation labs for visual and auditory impacts. (5) Development of an information system for source material on aesthetic research. (EPA)

17a. Descriptors--*Aesthetics, *Environmental effects, Quality control, Decision making, Design standards, Design criteria, *Planning, Federal agencies, Federal reservations, *Regional analysis, *City planning, Scenery, *Research priorities, Management, *Social impact, *Attitudes

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

17b. Identifiers --

17c. COWRR Field & Group --06G, 05G, 06B

Copy Available from GPO Sup Doc as EP 1.23 : 6 m/k-73/ -009, $ 2.05 ; microfiche from NTIS as PB 229 574 $1.45

18. Availability

19. Security Class. (Report)

20. Security Class. (Page)

21. No. of Pages

22. Price

Send To:

WATER RESOURCES SCIENTIFIC INFORMATION CENTER
U.S. DEPARTMENT OF THE INTERIOR
WASHINGTON, D.C. 20240

Abstractor Marilyn D. Bagley, Cynthia A. Kroll

Institution Stanford Research Institute

WRSIC 102 (REV. JUNE 1971)

W74-04987

EPA-600/5-73-009
November 1973

AESTHETICS IN ENVIRONMENTAL PLANNING

Grant No. 802441
Program Element 1HA098

Project Officer

Martin J. Redding
Environmental Studies Division
Washington Environmental Research Center
Washington, D. C.

Prepared for
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $2.05

ABSTRACT

This report addresses the relationship of aesthetics to environmental planning. The primary emphasis of the research is on the man/environment interaction, with the ultimate goal directed toward improving the understanding of aesthetic concepts and the implication of using those concepts in research and planning activities.

The historical development of the Western concept of aesthetics is explored with the aim of showing the relation of the concept to the particular set of attitudes at each period, to illuminate the way in which present concepts relate to today's world. Three primary aspects of the aesthetic concept are discussed; these include aesthetics and the human senses, aesthetics as thinking about the arts, and aesthetics as the science of beauty. Additional factors underlying the concept of aesthetics include: nature as an underlying force; cultural, social and economic phenomena as determiners of aesthetic expression; and aesthetics of American city life. Aesthetics is also discussed in the context of the National Environmental Policy Act.

Methodologies for measuring or quantifying aesthetics are reviewed, as well as a review of the state of the art of research in basic theory for understanding the unquantifiable. A similar review of selected planning agencies guidelines and procedures for integrating aesthetics into the planning process is followed with an outline of suggested future research needs.

This report was submitted in fulfillment of Project Number EGU(820)-2658, Contract R-802441, under the sponsorship of the Environmental Studies Division, Washington Environmental Research Center, Office of Research and Development, Environmental Protection Agency.

Preceding page blank

CONTENTS

ABSTRACT iii

LIST OF ILLUSTRATIONS vii

LIST OF TABLES vii

ACKNOWLEDGMENTS ix

I CONCLUSIONS 1

II RECOMMENDATIONS 3

III INTRODUCTION 5

IV AESTHETICS BROADLY DEFINED 9

Aspects of the Aesthetic Concept 9
Factors Underlying the Concept of Aesthetics 14
Aesthetics in the Twentieth Century 21
Administrative and Statutory Aesthetic Concepts 28

V THE USE OF AESTHETIC CONCEPTS IN APPLIED THEORY AND BASIC RESEARCH 39

Review of Methods for Measuring and Quantifying Aesthetics 40
Review of Aesthetics in Basic Research 100

VI AESTHETIC RESPONSIBILITIES IN THE ENVIRONMENTAL PLANNING PROCESS 105

Planning at the Federal Level 108
Planning at the State Level 132
Regional Planning 133
City Planning 141
Planning in the Private Sector 147
Summary 153

VII WHERE WE NEED TO GO FROM HERE 157

An Improved Understanding of Aesthetics for Environmental Quality 157
Research for Applied Theory 158
Research Directed Toward Improving Aesthetic Considerations in the Planning Process. 159

Appendix - EXAMPLES OF WORK DONE BY THE FEDERAL AGENCIES THAT INCORPORATE ATTENTION TO AESTHETIC IMPACTS 161

REFERENCES 169

Preceding page blank

ILLUSTRATIONS

1 The Historical Development of the Western Concept of Aesthetics 15

2 The Environmental Evaluation System (EES) Applied to a Specific Study 47

3 Benefits from Improved Water Quality 57

4 Depiction of Zones in a Landscape 67

5 Classification Framework for Litton's Method 72

6 Driver Tasks and Driver Activities Related to Scale of Seen Surroundings 80

TABLES

1 Visual Analysis Methods Numerical-Comprehensive Environmental Analysis Methods 63

2 Visual Analysis Methods Numerical-Independent Aesthetic Assessment Methods 70

3 Nonnumerical Visual Analysis Methods 85

4 Summary - User Analysis Methods 97

Preceding page blank

ACKNOWLEDGMENTS

The Stanford Research Institute research team included Marily D. Bagley, project leader, who was responsible for organization of the report and wrote Sections IV and V; Cynthia Kroll who wrote the section on Planning; and Kristin Clark, who did the first draft on Administrative and Statutory Aesthetic Concepts and also contributed to Section V. Robert Rodden and George Hopkins provided their administrative support.

The Stanford Research Institute staff members who reviewed and critiqued the draft copies were Ed Dickson, Tom Logothetti, Leo Weisbecker and Ward Stoneman. Consultants Bill Hill and Tom Wagner from Stanford University also reviewed the draft.

Review and critique of the final draft by Andy Euston, Office of Community Planning and Management, Department of Housing and Urban Development; Albert Melcher, Rocky Mountain Center on Environment; Larry Tombaugh, Division of Environmental Systems and Resources, National Science Foundation; John Gerba, Environmental Studies Division, and Fred Abel, Implementation and Research Division, Office of Research and Development, Environmental Protection Agency.

The advice and guidance provided for the section, on the broad definition of the concept aesthetics by Rudolf Arnheim, Harvard University, is gratefully acknowledged.

SRI acknowledges with gratitude the planners and other professionals who gave their time, judgment, and advice during field investigations and data collection:

John Urich, City Planner
Madison, Wisconsin

Hugh Iltis, Dennis Bunde, and Phil H. Lewis, Jr.
University of Wisconsin

Elizabeth Bardwell, Norda Bardwell, and Rebecca Young
Madison, Wisconsin citizen interest groups

Carl Steinitz and Peter Hornbeck
Department of City Planning and Landscape Architecture
Harvard University

Kevin Lynch, Michael and Susan Southworth, and Marvin Manheim
Massachusetts Institute of Technology

Preceding page blank

Marilyn Klein and Carl Rappaport
Office of Environmental and Consumer Affairs
Department of Transportation, Washington, D.C.

Larry Isaacson
Federal Highway Administration
Department of Transportation, Washington, D.C.

Kiyoshy Mano
Urban Mass Transit Administration
Department of Transportation, Washington, D.C.

Dave Aggerholm
Institute for Water Resources
U.S. Army Corps of Engineers

Ed Stone, Dr. Hilson, Dwain Lyons
U.S. Forest Service, Washington, D.C.

Hubertos Mittman
U.S. Forest Service, Rocky Mountain Region

Howard Alden
Colorado State University

Mr. Jenson, Glenn Taylor, Jay Bright
U.S. National Parks Service, Denver Service Center

Dennis Green
Office of Design and Construction
General Services Administration

Lani Lattin and Lois Craig
National Endowment for the Arts

Donald Appleyard
University of California, Berkeley

Joe Armstrong
California State University, San Jose

Robert H. Jarling, Environmental Planner
William La Mon, Landscape Architect
California Division of Highways, District 4

Michael Aulick, Regional Planner
Comprehensive Planning Organization
San Diego, California

Ms. Lani Ridenour, Assistant Director
Department of Environmental Quality, San Diego

Shiraz R. Kaderali, Land Use Advisor
Pacific Gas & Electric Company, San Francisco

Finally, the support of the project by the Environmental Studies Division, Washington Environmental Research Center, Office of Research and Development, Environmental Protection Agency, and the help provided by Martin Redding, Grant Project Officer and Peter House, Director, Environmental Studies Division, is most gratefully acknowledged.

I CONCLUSIONS

Based on the results of this study, the following conclusions can be drawn:

(1) Aesthetic concepts and individual aesthetic attitudes are directly related to the political, social, cultural, and economic phenomena of the period and are further influenced by conditions of the physical environment and the way these factors satisfy man's basic needs.

(2) The basic understanding of what constitutes aesthetic resources, natural amenities, the design arts, is at different levels of comprehensiveness in various agency guidelines and planning procedures. Evidence shows that the courts also have an undefined concept of what aesthetics is.

(3) Research in applied theory is deficient in responding to the needs of local planners and decisionmakers. Quantification methodologies tend to be overly complex, in addition to being highly subjective and value-laden.

(4) Basic research provides useful information for improving an understanding of the man/environment interaction that could be referred to for formulating aesthetic social policies.

(5) Planning at various levels of responsibility is only beginning to attempt to develop systematic methods for including aesthetic considerations in the planning process and decisionmaking for environmental impact analysis. There is limited evidence of attempts to use the visual or user analysis methods developed by consultants and researchers.

(6) The responsibilities for trying to develop aesthetic criteria and controls sift down from the federal level to the local government and private sector, providing little coordinated direction for comprehensive environmental planning.

(7) The lack of significant financial support and recognition of both the subject matter "aesthetics" and the design arts disciplines by policymakers and decisionmakers throughout planning agencies places aesthetics in a tenuous position for serious consideration.

II RECOMMENDATIONS

The research needs outlined in Section VII of this report should be jointly sponsored by agencies demonstrating prime responsibility for the related subject matter. Every effort should be made to elevate the status of aesthetics and the design arts in environmental planning. Primary emphasis should be placed on improving the understanding of aesthetics in the sociophysical context with direct relationship to man's aesthetic needs. Tolerance levels specifically related to aesthetic needs should be identified. A consistent social policy (preferably interactive) should be established at various levels of planning and decisionmaking. Appropriate guidelines and standards should be initiated to ensure that aesthetic rights are protected for present and future generations.

Criteria should be developed for evaluating the usefulness of studies in applied theory and basic research.

Professionals in the design arts should assume the responsibility for developing communicative tools (simulation labs and the like) so that the relevant public can respond intelligently when presented with information about aesthetic conditions in the environment.

III INTRODUCTION

This report addresses the relationship of the concept of aesthetics to environmental planning. By environmental planning we mean: the deliberate actions of man to control the use of natural and built environment. The primary emphasis of the research is on the man/environment interaction, with the ultimate goal directed toward improving the understanding of aesthetic concepts and the implications of using those concepts in planning activities and policies making cognizance of environmental quality. A further objective is to identify considerations for policymakers and to determine, in a normative fashion, the research required to advance the state of the art.

The term aesthetics appears in many of the federal and local guidelines for project planning. Consequently, there is an increasing need for the planner to be able to make rational decisions in cases where the aesthetic factors must be considered concurrently with social, technical, economic, and ecological factors. The problem lies in the fact that the understanding and implementation of aesthetic considerations for planned activities are at different stages of development in the various local planning departments and corresponding federal agencies. Likewise, policies guiding the consideration of aesthetic factors differ. The result is not only lack of consistency but conflict. A common understanding of the term aesthetics and a comprehensive systematic method for including aesthetic factors in the project planning process are needed.

If we assume that aesthetic impacts are felt directly by individuals, then it is evident that not all individuals will react in the same manner and to the same extent to a given aesthetic stimulus. This arises from a variety of reasons, but the important implication is that different individuals will make different value judgments of the same aesthetic feature. This attitude is reflected in the cliche "Beauty is in the eyes of the beholder." Ugliness, on the other hand, may be perceived and identified by diverse groups more easily. Junk lots, a high whining noise, a noxious odor are likely to receive common disapproval.

Aesthetic effects do not stop with the individual, however. Because aesthetic properties affect an individual's sense of well-being, they will affect the manner in which he accomplishes his day-to-day interactions with other individuals. Accordingly, direct aesthetic impacts on individuals are transferred through these interactions into collective social

Preceding page blank

effects. The behavioral manifestations of these social effects may not be uniquely related to aesthetic causes. For example, it will be difficult if not impossible, to trace a high incidence of antisocial behavior to generally prevalent poor architectural (or other) design. The important thing is establishing a communicative link between project planners and the community intruded upon. One can predict, perhaps, that an effort to make a structure pleasing to the surrounding community may carry a message that their value as people with feelings has been considered.

One of the most conspicuous tensions concerning aesthetics is the tension between the desire to set down absolute uniform rules about what is aesthetically pleasing and the desire to consider every project in its own context, without reference to any other. It is the position of this report that neither extreme is feasible. We do not yet know enough to establish absolute rules about what is pleasing, no matter how much we may know about what is not pleasant to look at or to be around. Also, the desire to approach every project as though it were completely unique is extravagant--in a world of limited resources, the waste of social funds is indefensible.

A social policy can operate in several different modes: predictive, interactive, or remedial. The rational implementation of a policy requires decisions based on a detailed knowledge of causal interactions, an explicit formulation of values, and criteria by which trade-offs can be made. We are just beginning to learn about causal interactions in the field of aesthetics, and to date the explicit formulation of values has been almost entirely in negative terms. The development of criteria for trade-offs has been almost entirely economic until just recently, with the introduction of methods to quantify and measure aesthetic attributes in the environment.

Because of the lack of information, predictive social policies concerning project aesthetics have been frequently unsuccessful, and sometimes spectacularly so. Remedial social policies (e.g., "plant morning glories") are better than nothing, but expensive. In the absence of sufficient information, the social policy most likely to be successful is the interactive policy, which suffers from the disadvantage of being difficult to implement and apparently inefficient. (It is always quicker and easier to go ahead and get the job done as it ought to be done, until one reaches the point where it has been completed and is obviously a mistake.)

Some attempts have already been made to include aesthetic considerations in the decision process for all kinds of projects, from bridges and dams to urban redevelopment, and there is abundant evidence that public opinion demands much more. Because of the law, (NEPA) the EPA is burdened with the task of defining their position for assessing aesthetic impact. Because of the present deficit of information, there is no way to establish a valid set of absolute rules about aesthetics. However, it is essential that the present chaotic state of aesthetic theories not be permitted to stand as a reason for inaction, or for evasion of responsibility for the aesthetic impact of projects.

In an attempt to assist EPA in defining where we are and where we need to go, for considering aesthetic impacts, in environmental planning this study has been organized into the following four major phases:

(1) The historical development of the Western concept of aesthetics is explored, with the aim of showing the relation of the concept to the particular set of attitudes at each period, to illuminate the way in which present concepts relate to today's world.

(2) The state of the art of measuring or quantifying the specific elements of aesthetics is surveyed in the literature with a review of selected methods and attention given to basic research for understanding the unquantifiable.

(3) The planning and policy implications of integrating aesthetics into the planning process are explored.

(4) Finally, the above tasks are summarized by outlining areas of primary concern and research needs identified for further study.

IV AESTHETICS BROADLY DEFINED

Multitudes of scholars have spent entire careers attempting to define aesthetics. However, unlike the definition of pi, explicit definitions of what constitute aesthetics tend not to be accepted as binding outside the particular culture that produced them. In general, Western tradition has considered aesthetics as being concerned with beauty or the fine arts. Although this aspect of aesthetics is too limited to be of much importance to EPA, the history of the concept of aesthetics is illuminating in understanding how closely linked aesthetics is to human perceptions through the senses and to cultural attitudes.

The etymology of the word *aesthetics* traces it back to a Greek origin where "things apprehended through the senses" were to the Greeks AISTHE-AISTHETA from the stem AISTHE, to feel. They were opposed to NOETA, "things thought," from the stem NOEIN, to perceive, from NOUS, mind. *Noetic* and *nous* have become the words of philosophy, but *aesthetics* has become the name for the general field of thinking about the arts, while *anesthetic* has become the term used in medicine for blocking the senses (Shipley, 1945).

A. G. Alexander Baumgarten (1714-62) is credited with coining the word AESTHETIC, in his work *Aesthetica* (dated 1750), to denote "that branch of science which deals with beauty" (Klien, 1966). Like beauty, then, the word has no clear and agreed-on definition that is operative--it remains a term that designates a vague concept. However certain aspects of this concept have evolved through historical use that can be agreed on.

Aspects of the Aesthetic Concept

Aesthetics and the Human Senses

The aesthetic concept is used when referring to things apprehended through the senses.

This concept is supported in direct relationship to our built or manmade environment by Kevin Lynch, who describes the importance of sensory perception in environmental aesthetics as follows (from *The City as Environment*, 1968): "The physical form of a city has a sensuous impact that profoundly conditions the lives of its people, and this is often ignored in the task city-building." One of the problems that Lynch addresses is the burden

Preceding page blank

of perceptual stress imposed by the city--not only the acoustic noise but noise in the sense of stimuli so jumbled together that no pattern can be discerned; physical discomfort in terms of winds in street canyons that blow grit unpleasantly against the skin, in terms of being jostled, of being assaulted by unpleasant odors. The perceptual stresses can go beyond our limits of comfort or even of tolerance.

The early separation of sensory perception and reasoning, established by Classical philosophers, has persisted. According to this theory, the senses passively take in data for the mind to process, and "The business of creating concepts, accumulating knowledge, connecting, separating, and inferring was reserved to the 'higher' cognitive functions of the mind" (Arnheim, 1972).

Rudolf Arnheim challenges this interpretation with his theory that visual perception is a cognitive activity. He makes his case in The Art of Visual Thinking (Arnheim, 1969) by stating "the cognitive operations called thinking are not the privilege of mental processes above and beyond perception but the essential ingredients of perception itself." Anthropologists have pointed out that some primitive peoples who have never seen a pictorial representation cannot "see" any information in black and white photographs of themselves--not only do they not recognize their own portraits, they cannot assign any meaning to the pattern of black and white until it is pointed out to them.

According to Arnheim, "such operations as active exploration, selection, grasping of essentials, simplification, abstraction, analysis and synthesis, completion, correction, comparison, problem solving, as well as combining, separating, putting into context ... are not the prerogative of any one mental function; they are the manner in which the minds of both man and animal treat cognitive material at any level."

Arnheim concentrates on the visual sense, but the same is true of hearing. Hearing is not merely the passive reception of certain frequencies of sound, but the processing of the information in terms of patterns recognition and other data processing operations. Physicians have discovered that the auditory nerve can remain unimpaired--as shown by the startle reflex--but "hearing" can be lost as the result of brain damage in the pattern recognition and data processing portion.

Speaking of the visual arts, Arnheim takes a case for education that can be extended to all the arts (and perhaps aesthetics in general):

> The arts are neglected because they are based on perception, and perception is disdained because it is not assumed to involve

> thought. ... the arts are the most powerful means of strengthening the perceptual component without which productive thinking is impossible in any field of endeavor. The neglect of the arts is only the most tangible symptom of the widespread unemployment of the senses in every field of academic study.

Arnheim points out that "The facilities of the sense of vision are not only available to the mind; they are indispensable for its functioning. If perception were nothing better than the passive reception of information, one would expect that the mind would not be disturbed by being left without such input for a while and might indeed welcome the repose. The experiments on sensory deprivation have shown, however, that this is not so. When the visual, auditory, tactile, and kinesthetic senses are reduced to unpatterned stimulation--nothing but diffuse light for the eyes and a steady buzz for the ears--the entire mental functioning of the person is upset. Social adjustment, serenity, and capacity for thought are profoundly impaired. ... the activity of the senses is an indispensable condition for the functioning of the mind in general. The continuous response to the environment is the foundation for the working of the nervous system" (Arnheim, 1972).

Aesthetics as Thinking about the Arts

Defining the term "art" is as difficult as precisely defining the term "aesthetics" or "society" or "beauty." Nevertheless in discussing aesthetic concepts constant reference is made to the arts and they are considered a tremendously powerful influence in human life. They deal with forces and mechanisms which are now only slightly understood; they affect the thoughts, emotions, desires, and actions of countless humans. To understand aesthetic concepts we must first understand the arts as psychological and cultural phenomena.

The first art theories in the Western Tradition were those of classical antiquity highlighting instrumental, or pragmatic art, which served some social purpose. These concepts of art and craft derived from interest in the functions and uses of art objects (including music). They included art as manufacture (artifacts) and art as an instrument of education or social improvement. The arts were closely integrated into the life of the ancient city state and were a vital part of social gatherings and religious ceremonies. They were thought of as having tremendous social value, since they raised man closer to the stature of the gods. Interest in the educational, ameliorative, and propaganda functions of art in society was dominant in classical antiquity and has remained one of the most prominent motives of instrumental thinking. The social status of the artisan was not exceptionally high; he was expected to demonstrate craftsmanship in his work from a utilitarian point of view. The instrumental theory resulted in a distinct split between art as manufacture (artifacts) and poetics and drama and their relationship to aesthetics.

Instrumental theories of art went on to include Medieval and Renaissance art where art was considered an instrument of religious and moral indoctrination. The resulting works of art, by their very nature, reflect control by some prevailing force, the city state, the church, the prince, based on rather uniform standards for art. Though there is little evidence of whether or not the masses actually agreed, these standards arose out of the general uniformity of culture in those segments of Western Europe society that generated works of art, the ranks of the church, and the nobility. A concept of a social aesthetics was an underlying factor for being able to establish a set of uniform criteria for evaluating the arts. For instance pictures with the wrong symbolism might be heretical; or lead to a revolt against the Prince.

Other forms of the instrumental theory came to the forefront during the Romantic period and still exercise strong influence on popular thinking in the 20th Century. Most important among these are the theory of art as a means of self expression, the conception of art as an instrument or language for the communication of feeling and emotion, and the view that art functions as a means for the expansion of experience through the imaginative prehension of attitudes, beliefs, judgments, valuations to which in ordinary life man would not subscribe.

It wasn't until the late 18th Century that the formalistic theories of arts were introduced. These theories presented the arts as autonomous, separated from function, thus beginning the notion of fine arts. The beauties of art, and the beauties of nature were often extolled for their influence in leading to a reverential apprehension of Divine Providence and for inclining the mind to ponder on manifestations of Divine purpose in the universe.

The beginning of the notion of "fine Art" had a significant impact on the position of the artist in society. The artist in the Romantic period was elevated to a grand position. He was considered a creative genius because he used his art to express himself. This factor also introduced the competitive market for art goods.

Art theories in the 20th Century show traces of all three categories: Instrumental, Naturalistic, and Formalistic. Instrumental theory is widened in the concept that the purpose of art is to afford occasion and scope for satisfying aesthetic contemplation. This thought is very close to the philosophical theories advocated by the Sophists. Art is supposed to present ideas of self expression and communication of unverbalized feeling and emotion, a carry-over from Romanticism. Art is also presented as a newly created reality subserving the purpose of appreciation. In many cases art is used to glorify nature and the ideal.

However, one difference must be pointed out in the 20th Century, and that is that the proportion of the population who have some personal acquaintance with fine art appears to be far higher than it was in the past, less as a result of mass education than as a result of increases in the number and variety of daily human contacts with urbanization. Thus, old theories that persist have not the same meaning as they had in the Greek city state, where only a small fraction of the men and almost no women really "knew" about fine art, or in the Medieval and Renaissance period of Western Europe, where the arts were confined to the larger churches (particularly cathedrals), towns, and palaces.

In general, two assumptions characterize 20th Century fine art theory: that aesthetic values take their source from the ultimate value of appreciation, and that works of art are new creations appraised aesthetically in relation to their value for appreciation. These two assumptions have become more dominant and more general through the first half of the 20th Century, and are mainly responsible for the distinctive tone of non-philosophical aesthetic writing today as compared with critical writing in the past. A third assumption can be made which relates to the applied arts (i.e., architecture, industrial design, interior design, landscape design), that is, one of functionalism that ascribes the value of art to its ability to serve a particular function.

Aesthetics as the Science of Beauty

Aesthetics as a branch of science that deals with beauty was defined and established by A. G. Alexander Baumgarten in 1750, but it has been a matter for debate primarily in this century. Attempts to define beauty have shown frustrated results--not all, perhaps, drawing the ridicule of Keats' famous definition "Beauty is truth, truth beauty," but none gaining full acceptance as valid.

In discussing the history of the attempt to define and delimit beauty, Osborne quotes Stewart (Philosophical Essays, published in 1810) as saying "the attempt to extract a common core of meaning from all its [beauty's] applications is futile because there is no common meaning ... It has long been a favorite problem of philosophers to ascertain some common quality or qualities which entitles a thing to the denomination of beautiful; but the success of their speculations has been so inconsiderable that little can be inferred from them but the impossibility of the problem ..." (quoted in Osborne, 1970).

As his solution to the problem, Stewart proposed to study instead the development of the human mind and "its natural progress in the employment of speech." However, linguistic analysis appears no more successful than any other method.

Factors Underlying the Concept of Aesthetics

Nature as the Underlying Force

Naturalistic assumptions were basic to art theory of classical antiquity and continued to be preponderant in the West until a century ago. This theory is still alive today, as expressed by those who expect the visual arts to provide a reasonably accurate reflection of the external reality which they use as their subject. This is an underlying factor which has influenced not only fine art, but is also evidenced in architectural theory (Frank Lloyd Wright, Gaudi) and has grossly attached itself to product design (plastic trees, fountains).

Probably the single most significant point to make in this presentation is the contrasting philosophies concerning nature between Western culture and Eastern culture. Western culture considers nature external to and set apart from man, something to be studied and observed with scientific objectivity, mastered and harnessed to man's uses, and reacted to emotionally. This point is referred to continuously in the literature on art history. To the Hindus, nature was an illusion just as man was. To the Chinese, man is an integral part of nature: the same life processes and rhythms transfused both man and nature. The Oriental ideal was to bring unification of the individual with cosmic principle, not to master, reproduce, or scientifically observe.

The significance of these basic philosophical approaches will emerge as the predominant force behind practical application of aesthetic concepts to planning and policy actions discussed in later sections of this report.

Cultural, Social, and Economic Phenomena as Determiners of Aesthetic Expression

From the 18th Century on, there has been a marked move away from the uniform social and cultural aesthetics of Classical and Medieval periods (see Figure 1). Today, in a democratic political and social setting,

	WESTERN EUROPE		AMERICA		
	Classical Antiquity	Medieval and Renaissance	18th Century	Romantic 18-19th Century	20th Century
ART	Pragmatic (Social Improvement)	Instrumental (Moral Indoctrination)	Formalist (Art Autonomous) 'Fine Art' Artifacts and Crafts 'Folk Art'	Art as a Social Comment	Instrumental (Functionalism) Naturalistic Formalistic (Art Aristocratic and Democratic)
AESTHETIC CONCEPTS	Tied to Poetics, Music and Architecture	Tied to Religious Ceremony	Fine Arts (Divine Providence) Aesthetics as Beauty (1750) Public Concern for Beautification (Town Squares-Buildings)	Age of Enlightenment	Aesthetics in Psychology, Sociology, Fine Arts, Nature
CRITERIA	Uniform Standards (Social and Cultural)	Uniform Standards of Excellence Established by Church and State	Mixed Standards • Puritan Ethic • Civic Pride • Upper Class Taste	Social Justice	Individual Values in Appreciation (Good Taste) Cost
POLITICAL	City State	The Pope The Prince	Colonialism Town Meeting (Town Ordinances)	Revolution	Democracy
PHILOSOPHICAL	Sophists		Theoretical Aesthetics Philosophy of Beauty		Scientific Method Empirical and Analytical (Psychology, Sociology, Anthropology)
SPIRITUAL	The Greek and Roman Gods – A Pragmatic Spiritualism	The Church	Quaker Influence	Humanism	Scientific Rationalism Decline of Religion Materialism Alienation
ECONOMIC	Crafts Agriculture		Trade Crafts Agriculture	Trade	Industrialism Capitalism

FIGURE 1 THE HISTORICAL DEVELOPMENT OF THE WESTERN CONCEPT OF AESTHETICS

public participation in the arts is individualized, is based on personal incentives, and is almost unstructured. Other than a few fragmented efforts to use art as an instrument for social amelioration and social comment, the trend toward "art for art's sake" puts aesthetics in the eyes of the beholder and takes it out of the state and the church. This fact strongly influences the character of our cities and neighborhoods where individual preferences in taste and style are most obvious. The competitive nature of the architectural market is reflected in the low-bid quality of the product.

Prior to the Industrial Revolution, art was a term used to describe all manmade objects, including those used in everyday situations, that showed ingenuity or served some useful function. These include handicrafts and products of workshop industry. The artist was considered a craftsman and his success depended on his ability to shape an object to serve a defined purpose. Uniform standards of excellence applied to all products. From the Industrial Revolution on, there have been changes that influence not only the quality of art, but also its use.

The factory system of production resulted in poverty, ugliness, and depression for a new class of workers along with the emergence of a prosperous middle class weak in indigenous cultural traditions. As one consequence of mass production, society was geared as seldom before to standards of utility measured in economic and monetary terms, while mechanization seemed to deprive the factory worker of the opportunity for self-expression or identification with his job. The fine arts as defined in the 18th Century (painting, sculpture, music, drama, poetry) were reserved for the economic strata with the money and leisure to indulge in them, while the industrial or "applied" art were products for society in general. The architect, industrial designer, and commercial artist are placed on the practical side of art and respond to the fluctuations of the consumer market (which is heavily influenced by industry). Creativity and quality are puppets of cost and profit, particularly in architecture. Consumption of paintings and sculpture is based on style and taste as reflected by the trend setters in upper class society. "Art" is determined by what a person can afford in terms of time and money; it is used as a status symbol rather than a life style.

In contrast to the industrialized aesthetic, a few significant strides in contemporary society show the emerging currents of a return to the handicrafts (pottery, leatherwork, sewing, weaving, sculpture, painting), particularly by the younger generation, and a renewed interest in agrarian pursuits by "return to the earth" enthusiasts.

Additionally, the growing interest in the natural environment has spurred a trend toward an appreciation of nature in its raw state. Efforts to preserve natural areas (wilderness) and reassess the use of natural resources will be recorded in history as a dominant characteristic of the 1970s. Evidence of this interest is expressed in Section V of this report.

The Aesthetics of American City Life

From the early part of the 18th Century on, the newly settled American colonies began showing signs of urbanization in the larger towns. Two overriding influences in shaping the character of the Eastern colonies were the reliance on trade with Europe and the English Puritan Ethic. More than any other factors, these two gave the communities the basic homogeneity so characteristic of New England. Though each of the leading towns of the English colonies developed characteristics distinctly its own--in architecture and overall appearance, in intellectual interests and emphasis upon some of the amenities at the expense of others, in religious and social attitudes, in forms of municipal government, and, to a lesser extent, in economic organization--differences were fewer and less basic than similarities.

As stated in The Rise of Urban America by Constance McLaughlin Green (1965),

> the major provincial capitals not only resembled one another in their modes of life but long had a closer affinity to Europe than to the frontier, for the Atlantic Ocean was a lesser barrier to the movement of people, goods, and ideas than were the vast westward-stretching forests of the continent.

Architectural styles in the early cities showed a close affinity to classical and European taste, even in some cases, to the extent of trying to reproduce Palladian stone buildings in timber. The proliferation of handsome public buildings in the colonial towns was an expression of civic pride shared by all citizens, though it received special impetus from the mercantile aristocracy. (Some of the buildings were put up at the expense of rich individuals or groups of merchants.) Still, the basic similarities with the classical city-state attitude toward art and craftsmanship were evident.

Green (1965) goes on to describe American cities in the following:

> If the amenities of city life in contrast to rural were less evident than in the 18th Century, the city still formed the

substance of American civilization. It was in the cities that men by mutual imitation changed toward what they considered improvement. While urban architecture usually suffered from the tastelessness of the Monroe P. Joneses, public buildings in a great many cities continued to achieve a dignity and grace of line that vied with the best in contemporaneous Europe. Philadelphia, birthplace of much of the finest architecture in the United States, managed to preserve the central core around Independence Hall from the inroads of the early Victorian era. The national capitol at Washington also testified to American search for beauty. Like other foreigners before and after him, Charles Dickens poked fun at the "city of magnificent distances" where rubbish-strewn vacant lots and unsightly shanties marred the effect of imposing white-stone-pillared federal office buildings, but discerning persons, however unenthusiastic about the classical architectural style, perceived grandeur in the concept and could envisage its possibilities. At a later date Englishmen who admired the Crystal Palace and the Victoria and Albert Museum were scarcely in a position to ridicule the turreted red-brick Norman castle erected in the 1850s for the Smithsonian Institution at Washington.

In domestic architecture in the 1830s and 1840s North and South alike fell under the spell of the Greek Revival. Self-schooled carpenters learning from books of drawings generally built the handsome houses that rose along the Gulf coast, in New England, in Baltimore, Cincinnati, and scores of cities between and beyond. In the old section of New Orleans the imprint of 18th-Century French and Spanish rule was still visible in the stuccoed walls and iron grill work, arches, balconies, and inner courts with fountains and statues half-covered by roses and vines; the newer American quarter seldom succeeded in reproducing that charm. The Spanish influence was even clearer in Texas towns and the trading posts of New Mexico. Although jerry-built monstrosities cropped up in all cities, particularly in the newest and rawest, civic pride in time impelled men to put up more substantial, and, by their standards, more beautiful buildings. The rows of houses standing shoulder to shoulder flush with the streets in colonial towns rarely had counterparts in newer cities. There, fenced yards, sometimes adorned with flower beds, ordinarily surrounded private dwellings.

The cities were also the cultural centers of the country. They prided themselves in offering the finest galleries, museums, and concert halls as attractions for the special class of society that could afford such luxuries.

Early in the development of America, government controls were instituted for public benefit. Much of the background of the establishment of town ordinances had considerable influence for maintaining the natural amenities of the urban community. It is also evident in early history that private citizens provided the real impetus for establishing ordinances governing sanitation, drainage, street extension, and police and fire protection. It was often the Quaker sense of community responsibility that spurred this action. These ordinances and the early strivings of private citizen interest groups are obvious forerunners to the Environmental movement of the 20th Century.

In addition, as early as 1833, George Caitlin advanced the idea that areas of the country should be maintained as national parks (he assumed the addition of real Indians as sort of a living diorama, but the idea of preserving areas intact in their magnificent wildness was one seed of the eventual National Park system). Jonathan Edwards, the Puritan preacher, extolled the virtues of nature as enhancing our awe for the divine, but until there were enough buildings to cut off the view, Americans tended to consider great unspoiled vistas of scenery as probably crawling with bears and Indians, and at best an inconvenience.

The gardens of Europe seemed less important in a country where nature was just outside the door, and when gardens were constructed, they were less on the "naturalistic" plan of, say, Capability Brown, and more an attempt to extend the area of control and discipline out from the house in formal plots and hedges.

It took some time for the landscape gardening of the Romantic period in Europe to come to America. Coming mainly from England, the interest in Romantic landscape spread rapidly after 1830. People not only began to look at views, they began to construct them. Julius Fabos (1973) stated in a recent article "Tree-planting societies were beautifying and laying out village commons, cemeteries, and local academies in the picturesque Romantic style. Today the fenceless suburbias with winding roads and large setbacks provide the same parklike quality developed during the 19th Century Romantic-Landscape Movement."

The need for harmony between man and nature was evidenced in the mid-19th Century preachings of Thoreau, Olmsted, and their contemporaries and had a great impact on the subsequent movement to protect the "monumental beauty" of the West. Fredrick Law Olmsted had laid out Central Park in

New York City in the 1860s, and in the early 1870s landscaped the grounds of the Capitol in Washington. But, greatly admired though his work was, it had not made sufficient impression to persuade other cities to undertake formal programs of beautification. Green (1965) goes on to say

> City planning consequently received its initial impetus from the team of architects, sculptors, and landscapists, Olmsted among them, to whom Chicagoans entrusted the task of laying out the fair grounds for the Columbian Exposition of 1893. Local promoters who had adopted the slogan "Make Culture Hum" were as overwhelmed as the country visitors to the fair at the beauty of the "White City" that arose along the swampy lake shore to the south of Chicago. The achievement gave birth to the City Beautiful movement, for if a handful of artists could build in a year so exquisite a creation, eclectic though its architecture was, other men could emulate them, at least in formulating and adhering to a consistent over-all scheme. The depression of the 1890s delayed action, but with returning prosperity cities from coast to coast set about drafting plans for land purchases and improvements that would enhance their looks.
>
> Washington, where an advisory park commission mapped out an elaborate proposal, was the first city to see results. Congress authorized the removal of railroad tracks from the Mall and accepted the commission's recommendations about the location of new government buildings and the landscaping of the public domain. Elsewhere progress was largely on paper, although several cities launched campaigns to get rid of billboards and similar eyesores. While Boston laid out the park along the Fenway, she did little to develop the 5,000 acres of land beyond the city limits which she had bought in the 1890s for a public recreation area; Chicago made no better headway in carrying out plans for a grand esplanade along her twenty-mile lake shore. San Francisco, nearly completely destroyed by an earthquake and fire in 1906, rejected a formal scheme for rebuilding.
>
> Yet ideas were germinating; in time Patrick Geddes' "City Development," published in 1904, would bear some fruit. New Haven managed to restore some dignity to the old town green, and, in preparing for a centennial of the Louisiana Purchase, St. Louis took a fresh look at the possibilities of her river front, the "Gateway to the West." Los Angeles planned a mile-long, two-hundred-foot-wide avenue ending in an impressive plaza.

> Ridden with graft, vice, and crime, pocked with ugliness and human wretchedness, urban America was nevertheless stirring itself to build anew. (Green, 1967.)

Thus, Olmsted and others helped to bring about the preservation of some unique landscapes in several parts of the United States and their values have influenced the attitudes of the National Park Service.

Aesthetics in the Twentieth Century

Thomas Munro (1954) defines aesthetics today as "a subject which aims primarily at a theoretical understanding of the arts and related modes of behavior and experience." He goes on to say "Unless so limited, aesthetics is understood as general or comparative aesthetics, covering all the arts and the varieties of behavior and experience connected with them. It thus investigates not only the products, but also the processes and abilities involved in creating, using, enjoying, appreciating, and evaluating the arts" (Beardsley and Schneller, 1967). This definition covers a wide range of activities, extending outside the arts themselves. It is broad enough to include not only human response to art but human response to objects other than works of art: to scenes in nature, for example. The concern of aesthetics with general theory, which sets it apart from specialized studies of the arts, has thus evolved from its early history as a branch of philosophy. In the 18th Century and early 19th Century, aesthetics was commonly defined as "the philosophy of beauty." At that time, aesthetics was highly abstract and speculative, often paying little attention to works of art or other concrete phenomena. It was devoted largely to such questions as whether beauty is an objective property of things, or whether it is merely a subjective human feeling. If aesthetics could find some eternal "laws" of beauty, the laws would provide a foundation for value judgments about works of art or greatness in the artist, and such laws would form explicit rules for the guidance of the artist.

Considerable debate took place among 20th Century philosophers on the subject of defining art and beauty. Clive Bell and George Santayana searched to discover "the essential quality of works of art, the quality which distinguishes works of art from all other classes of objects," and "some quality common and peculiar" to all beautiful things. Others, such as Dewitt Parker, Paul Ziff, Morris Weitz, and W. E. Kennick, maintained that any common feature of all things traditionally and currently held to be beautiful would turn out to be trivial and not worth pursuing.

Osborne recognizes a new way of tackling aesthetics that began to come into vogue in the 1930s. This systematic process he characterizes as "of a cautious, empirical, analytical but more rigorous temper, which was reluctant to generalize but more keenly alert to the special characteristics of the individual arts" (Osborne, 1970). In actuality the approach can be dated to the 19th Century when the trend toward the protoscience of art philosophy began. In this most recent development, the focus seems to be on the logical exercise of clarifying the conceptual apparatus of criticism. Each of the arts is examined separately with the intent of rendering explicit the different criteria of valuation that are employed. No common rules for beauty are derived; instead, "the establishment of uniformities was treated either as premature or, sometimes, as dangerously obscurantist" (Osborne, 1970). Osborne acknowledges that some of the studies made contributed to the clarification of particular problems and to the separation of genuine from spurious issues in particular small areas, but he claims that the fragmentation entailed in the approach keeps it from being fruitful in terms of producing congruent conclusions.

Some very useful studies have been conducted which aimed at clarifying specific aesthetic concepts and delving into their logic. Frank Sibley's work ("Aesthetic Concepts" in Philosophy Looks at the Arts, 1959) addressed the difference between features of works of art and other familiar things around us as a difference between aesthetic and nonaesthetic terms. Nonaesthetic terms (such as red, noisy, clammy) refer to features which are observable by "anyone with normal eyes, ears, and intelligence." Aesthetic terms on the other hand (such as dainty, delicate, graceful, elegant) refer to features of things where judgment requires the exercise of taste or sensibility. In contrast, a study by Isabel Hurgerland points out that aesthetic properties include "those features of everyday perception which the gestalt psychologists have called attention to." They are sometimes called "emotional" or "physiognomic" properties--such as the cheerfulness of some colors, the grace of some movements.

These studies represent a new trend in the philosophical interpretation of aesthetics. The new trend is broader in scope, making aesthetics almost coextensive with the study of perception. Terms such as awkward, graceful, dainty, enter into our ordinary everyday recognitions and descriptions of things; they have no special attachment to works of art or things of beauty.

From the 19th Century on, aesthetics has steadily progressed in the use of scientific method. It has become more empirical, basing its conclusions on the observation of works of art and related phenomena, instead of deducing them from religious and metaphysical assumptions. It is working in the spirit of natural science, insofar as man and all his works are considered as parts of nature. It is becoming a humanistic science, like psychology and sociology, insofar as man and his arts are contrasted with nature.

In fact, according to Osborne and Munro, aesthetics could not become a scientific study of the arts until psychology and sociology had furnished the prerequisites. Psychology had to provide a general, naturalistic conception of human nature, including its basic processes and functions, and various types of personality, which would hold up in the arts as in other activities. Sociology, ethnology, and anthropology had to show how art arises and functions in different cultural settings, and how art changes as society evolves. Aesthetics makes constant use of terms, concepts, and data from psychology and from the social sciences.

The danger in discussing aesthetics as a science is that confusion is likely to arise from the indiscriminate mixing of statements of fact with judgments of value. If this happens, feelings about some aesthetic characteristic in an object may be expressed as if they were inherent, objective properties of it. Scientific method does not require that man suppress or conceal his likes and dislikes, but only that he keep them distinct from his conception of the facts, and not allow them to influence his conception where he can prevent it. Munro addresses this problem by saying, "Values are facts in one sense; that is, they are somehow actually involved in the phenomenal world and in the interaction between humans and their environment. They are not mysterious, transcendent entities or pure ideas inaccessible to all empirical research, but they are a peculiar kind of fact, usually hard to investigate empirically" (Beardsley and Schneller, 1967).

Accordingly, in aesthetics, the trend toward sciences involves an effort to eliminate evaluation and personal preference from certain phases of inquiry: to make them purely descriptive, neutral, and as objective as possible. This can never be entirely complete, since all human thinking is conditioned by the architecture of the human nervous system, by individual personality, and by cultural environment. One evaluates by implication, merely in picking out certain problems and examples as worth studying.

In addition to psychological theories for art and aesthetics, two contrasting strands of sociological theory have been evidenced in the 20th Century. One maintains that art has been influenced by social and economic conditions and the changing patterns of civilization, and the other claims that art influences society and individuals. From whichever point of view it sets out, the sociological study of the arts may be treated either as a descriptive discipline or as discipline that establishes norms. The first, the descriptive mode, claims that taste, and therefore the production of art, is influenced by geographical, climatic, racial, and historical factors. The 19th Century evolutionists went on to claim that the arts do not exist outside the system of natural cause and effect. Art is not the result of some divine inspiration or any impulse not explicable by natural laws; it is evolved by natural processes along with other social and cultural developments. The evolutionists pictured it as emerging at a late stage from prehistoric technologies through a gradual advance in the adaptation of means to ends. Emphasis was placed on the value of art as reflecting the spirit of an age, national character, economic conditions bearing on market and demand, factors of religious faith, common ideals and endeavors, and in a word, all "that contributes to the understanding of any cultural period."

Osborne points out that "Through most of the 19th Century thoughtful minds were preoccupied with the more immediate social and economic consequences of the changes brought about by the Industrial Revolution and with their more distant spiritual and cultural effects."

The arts were turned to as a possible instrument for rescuing society from the grave peril of the age. The sociological aesthetician Jean-Marine Guyan (1854-88) in his book L'Art au point de vue sociologique (1887) evolved an aesthetic which was designed to break down the barriers which separate art from the other aspects of civilization and represented aesthetic experience, with its culmination in artistic enjoyment, as a restoration of harmonious living and a sense of belonging which is the denial of estrangement and alienation. Art is identified with the sense of beauty, and the sense of beauty is expanded to become an ideal of all healthy and harmonious life-experience. The feeling of beauty, Guyan maintained, was explained as "the higher form of the sentiment of solidarity and the unity in harmony; it is the consciousness of a society in our individual life."

William Morris in England set out to glorify earlier handicrafts, trying to remedy the ugliness that resulted from the factory system of production. Ruskin set out to prescribe tastes and preferences for a newly emerging middle class strong in money but weak in indigenous cultural traditions. Society demanded the completion of the Industrial Revolution but set out at the same time to provide uplift for the factory worker, whom mechanization seemed to deprive of the opportunity for self-expression or identification with his job. These uplift and improvement attempts, conducted outside of working hours, were an attempt to impose acceptable mores and values on workers seen to have none of their own and to be in danger of becoming subhumans. In some cases, the failure of these attempts led to the diagnosis that workers were somehow "different," the proletariat, a group apart. This view results in Marxist rhetoric in some countries and in alienation rhetoric in the United States. Only recently has an acknowledgment been made that the factory worker has a culture of his own that is neither subhuman nor all that far removed from the culture of the office worker.

A growing sense of isolation and estrangement has become evident in the 20th Century. Alienation has come to be regarded as the chief spiritual malady of our age. It is seen both as a metaphysical isolation of the individual in a post-Christian world of thought, and as a psychological alienation in the depersonalized world of technological culture.

John Dewey, in Art and Experience (1934), defines the work of art as not the actual product but "what the product does with and in experience." Dewey gives it as the primary task of anyone who writes about philosophy of the fine arts "to restore continuity between the refined and intensified forms of experience that are works of art and the everyday events, doings, and sufferings that are universally recognized to constitute experience."

Herbert Read, in his book Art and Alienation (1968), illuminates the problem of "alienation" of the arts and artist in our modern technological society by analyzing the characteristics of the modern movement and the difficulties involved in communication between the artist and his public. Read advocates the view that aesthetic activity is a formative process with direct effect both on individual psychology and on social organization. He states that "never before in the history of our Western world has the divorce between man and nature, between man and his fellow-man, between individual man and his 'self-hood' been so complete. Such is one of the main effects of that system of production we call capitalism as Marx foresaw. We now realize that not capitalism alone, but the whole character and scope of a technological civilization is involved (the end of capitalism in certain countries has not meant the end of alienation). To change the world, meaning the prevailing economic system, is not enough. The fragmented psyche must be reconstituted, and only the creative therapy we call art offers that possibility" (Herbert Read, 1969).

If art and aesthetic concepts are truly a reflection of our society, then we must examine our way of life, a direction advocated by a majority of art historians--our social structure, our methods of production and distribution, the accumulation of capital and the incidence of taxation--to decide whether it is not in these factors that we should look for an explanation of our aesthetic impotence. However, note that Read demands the country admit to aesthetic insensitivity--a point with which some might disagree.*

Read points to three characteristics of our civilization which are patently inimical to the arts. First is the general phenomenon of alienation which he defines as the "progressive divorce of human faculties from natural processes."

Another characteristic of contemporary society inimical to the arts is the decline of religious worship, attributed partly to the growth of scientific rationalism. Read claims that "the nature of the cosmos and the origins and purpose of human life remain as mysteries, and this means that science has by no means replaced the symbolic functions of art, which are still necessary 'to overcome the resistance of the brutish world'" (Read, 1969).

The third characteristic Read talks about is that the values of art are essentially aristocratic; they are not determined by a general level of aesthetic sensibility, but by the best aesthetic sensibility available at any particular time. According to him, this is a faculty possessed by relatively few people--the arbiters of taste, the critics and connoisseurs and above all, artists themselves--and the level of taste is determined by their intercourse. Again, the contrast to the classical aesthetic life-style of the city state and early American colonialism is widened. The uniform values and public participation so characteristic of the arts in societies have now been replaced by a very personalized and fragmented social aesthetic.

In fact, what we face today is a society pioneered in the development of an industrial revolution, where wealth and leisure are broadly distributed and a rising standard of living exists for all. We have a society committed to material progress. Incomes have risen but there is little evidence that a proportionate rise in cultural attainment comparable to the past achievements has taken place. August Heckscher writes in his article "The Quality of American Culture" in Goals for Americans (1968) that "The general advance in well-being seems to have brought with it a lessening of moral intensity and a readiness to indulge in secondhand experience. The ethic of the contemporary economic system emphasizes consumption, with 'happiness' and 'comfort' as the objectives to be sought. The end product seems to be a great mass prepared to listen long hours to the worst of TV or radio and to make our newsstands--with their diet of mediocrity--what they are" (Heckscher, 1960).

---

*His view implies that art can only be what it has been, and current forms of expression, such as science fiction, jazz and rock, Bob Dylan, and the Beatles have no art to them. But must we be counted off as freaks because our art forms are not those of Fragonard, Michelangelo or Bach? We now see African masks and Indian baskets as art forms-- can we not see our own works that way? Or at least as transitional forms?

Hecksher condemns the lack of public monuments.

The effects of the Industrial Revolution are exceedingly obvious in American life style. Urban life, for instance, has been altered by industrial developments such as the mechanical refrigerator, canned goods on grocers' shelves, mechanized housekeeping gadgets, all of which contribute to lessening the burden on the housewife and mother and freeing her time for other activities. And other industrial achievements such as a method of fabricating standardized concrete building blocks or facing panels gave the construction industry an economical, fireproof material, so that contractors could begin to put up substantial five- and six-story apartment houses. Large-scale production of heavy duty electric power transmission cables contributed to a dispersal of factories to sites supplied by truck rather than railroad. All of these factors contributed to shaping the manmade, or "built" environment of our urban areas, but the single most influential development of all has been the automobile. Surely a separate study could be made which addresses the aesthetic implications of the automobile. Green (1965) notes that

> Civic pride, fortifying notions of convenience, also asserted itself in building parkways to speed automobile traffic through business districts and out to residential areas, while highway engineers and planners paid at least lip service to urban beauty.

He also noted that the Federal government created a National Capital Park and Planning commission in Washington to buy land for parks and scenic drives. New York City built a two-level parkway along the Hudson River below Riverside Drive; in lower Manhattan realtors bought up office buildings, replaced them with seventy-storied skyscrapers, and ran the Empire State Building to 102 stories. Here was a model. In the vast spaces of the Great Plains, Tulsa and Oklahoma City, scarcely more than villages before the discovery of oil in the region early in the century, burst forth with skyscrapers and parkways. Chicago undertook the long-talked-of lake shore development with a stadium, fountains, and acres of automobile parking laid out to the south of the Art Institute, and "outer drive" to the east stretching from the site of the 1893 World's Fair to the far north side, and a new natural history museum and a planetarium built on land made by fill along the lake front formerly preempted by the Illinois

Central Railroad trade. The heavy tower of the Chicago Tribune Building rose fifty-two stories on Michigan Avenue; nearby on the Chicago River, where the wholesale vegetable and fish markets had stood, Samuel Insull, transit tycoon, erected an imposing opera house; and across the river Marshall Field & Company built a mighty Merchandise Mart. Thus, the first indication of contemporary interest in urban aesthetics by engineers and planners.

Surban sprawl and central city development, rarely taken very seriously, before 1950, suddenly became a source of anxiety to both city and suburban administrators, spurring a growing army of professional planners to draft schemes for the orderly development of urban areas. Terminology for making aesthetic considerations became a part of the vocabulary of architects and urban planners everywhere. Terms such as "variety," "scale," "character," "uniqueness," "patterns," "texture," and many others were used to describe the aesthetic quality of an urban area.

Today, project planners face considerable pressure from private citizens on aesthetic issues. The purely functional cost-conscious engineering feats are no longer acceptable by communities adjacent to planned projects. A careful balancing of all aspects, including aesthetics, is now required in every planning activity. Passage of the National Environmental Policy Act (NEPA), 1969, placed further restrictions on planning activities (at least publicly funded or licensed projects).

Administrative and Statutory Aesthetic Concepts

In the NEPA Context

A growing concern for environmental quality by policymakers and certain sectors of the American public ultimately resulted in The National Environmental Policy Act, 1969 (NEPA).

The objective of preserving aesthetic resources is clearly expressed in the NEPA where the Act requires the "Federal Government to use all practicable means ... [to] ... assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings ... [and to] ... preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice "(NEPA Sec. 101(b) (2,4). To accomplish this, Federal agencies are directed to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment" (NEPA Sec. 102(a)). Though the disciplines are never identified in the Act the word "design" has direct implications for human involvement, therefore "environmental design arts" would seem to include: architects, landscape architects, industrial designers, interior designers, urban designers. Another topic of concern resulting from the Act is that of defining "aesthetic resources," since one of the expressed purposes of the Act is "to enrich the understanding of the ecological systems and natural resources important to the Nation," (NEPA Sec. 2). One might ask how aesthetics of the natural environment is a resource "important to the Nation."*

NEPA goes on to state that "all agencies of the Federal Government shall ... identify and develop methods and procedures, in consultation with the Council on Environmental Quality ..., which will insure that presently unquantified environmental amenities and values may be given appropriate considerations" (NEPA Sec. 102(b). It becomes obvious after reviewing Agency guidelines and planning procedures that the state of the art for accomplishing this is at best in its infancy. Yet this section of the Act is no doubt the one that initiated development of the methodologies for measuring and quantifying aesthetics (reviewed in the following section of this report).

Appendix II of the May 1973 CEQ Guidelines to the NEPA (F.R., Vol. 38, No. 84, p. 10862) is a list of Federal agencies with jurisdiction or "special expertise" in different areas of environmental impact. "Esthetics" is listed under "Land Use and Management." However, no agencies are listed for reference, yet there is a note saying: "Numerous agencies have developed specific methods of assessing esthetics in relation to their area of responsibility."

Although the NEPA and CEQ recognize the necessity of considering aesthetic impact in environmental impact analysis, guidance on how such impact should be considered and by whom is presently extremely vague.

---

*For instance, a number of public interest trends (i.e., Sierra Club scenic posters purchased, tourism, backpacking, and bicycling for leisure activities) could be cited as an indication of resources important to the nation.

Federal Agency Environmental Impact Statement Guidelines

The response of various Federal agencies to the NEPA concept of aesthetics and "environmental design arts" can, to some degree, be seen in their guidelines for preparing environmental impact statements (EIS). The following are excerpts from Agency guidelines that explicitly address aesthetics.

The Department of the Interior, in their guidelines, make no direct mention of aesthetics, but use related terminology such as "cultural resources" and "social well-being," presumably meant to include aesthetics among other concerns. The "destruction of archaeological or historical sites" is listed as one of the possible irretrievable commitments of resources. The statement that an EIS must be prepared "if the environment or its uniqueness may be significantly affected" could easily be interpreted as implying that unique aesthetic considerations might constitute the need for an EIS (i.e., The Grand Canyon, Niagra Falls, the Redwoods).

The HUD guidelines to the NEPA are primarily procedural but they do include an appendix with definitions of key words, one of which follows: "Environment is not defined in the basic legislation or in the CEQ guidelines. However, it is clear from section 102 in the Act and elsewhere that it is broadly defined to include physical, social, and aesthetic dimensions."

The Federal Highway Administration guidelines to the NEPA refer to the human environment as "the aggregate of all external conditions and influences (aesthetic, ecological, biological, cultural, social, economic, historical, etc.) that affect the life of a human."

The U.S. Forest Service guidelines to the NEPA see aesthetics in terms of scenic, historical, or archaeological areas. They also mention "visual pollution" as a possible adverse environmental effect which cannot be avoided.

It is apparent that various Federal agencies have responded differently to the NEPA's expressed desire to "assure for all Americans ... esthetically and culturally pleasing surroundings." In general, the terminology relating to aesthetics, which is vague and undefined, could be interpreted that the agency guidelines for preparing EIS intend the various responding planning departments to adopt their own functional definitions of aesthetics and "environmental design arts" which are applicable to their specific areas of responsibility. Section VI of this paper will discuss the ways various planning agencies have incorporated aesthetic concepts in their planning process.

Aesthetics in the Courts

The involvement of the American courts with aesthetics has not been only a recent development; cases dealing in some way with aesthetics can be found at least as far back as 1888 (Burke v. Smith). Aesthetics has appeared as a legal concern in the contexts of nuisance, zoning, and administrative decision making. The following is a brief review of these three legal issues as they relate to aesthetics, as they appear in three excellent articles:

"Aesthetic Nuisance: An Emerging Cause of Action," New York University Law Review, November 1970.

"Aesthetics as a Legal Basis for Environmental Control," Leighton L. Leighty, Wayne Law Review, July-August 1971.

"Aesthetics and Environmental Law: Decisions and Values," Robert Broughton, Land and Water Law Review, Vol. VII, 1972.

The reader is directed to these articles for a more comprehensive review of aesthetics in the courts than is possible within the scope of this report.

> Happily, the day has arrived when persons may entertain appreciation of the aesthetic and be heard in equity with vindication of their love of the beautiful, without becoming objects of opprobrium. Basically, this is because a thing visually offensive may seriously affect the residents of a community in the reasonable enjoyment of their homes, and may produce a decided reduction in property values. Courts must not be indifferent to the truth that within essential limitations aesthetics has a proper place in the community affairs of modern society. (Broughton, 1972)

This is a portion of a dictum from the Parkersburg Builders Material Co. v. Barrack case (1937), which involved the use of land as a junkyard in an allegedly residential neighborhood. The court ruled that the defendants would have to construct a structure which would protect the residents from the "visually offensive" business. On appeal, however, the court reversed the decision, on the basis that the neighborhood was not proven to be residential (New York University Law Review, 1970). In his article, Broughton makes the comment that "one should not be surprised that courts occasionally make stirring statements of principle, as in Parkersburg Builders Material Co. v. Barrack, and then back off from holding that the law has been violated." Along these same lines Leighty says:

> The problem appears seldom to have been insensitivity to the need for the functions that beauty may serve in a quality environment. Instead, the reluctance seems to have had its origin in the general common law protections for property interests against governmental constraints ... (Leighty, 1971)

In nuisance cases such as the above (New York University Law Review, 1970), the balance between property rights and individual freedom is the essential issue, and in many cases in the past, aesthetics has had to bow to individual freedom:

> The early attitude toward aesthetics [was that] beauty was a matter of luxury, and interference with the freedom to use property as the owner saw fit was permissible only where necessity, life or health was at stake (Broughton, 1972).

In this regard, smell and sound nuisances have been easier to prosecute than sight nuisances because they can be directly related to matters of health:

> Sights are felt to present problems of defining a reasonably certain standard ... in part due to a feeling ... that there are no stable standards of beauty (Broughton, 1972).

> The problem for nuisance cases is not the determination of what is beautiful ... the problem is whether the conduct of a particular defendant interferes unreasonably with the use and enjoyment of the plaintiff's land (Broughton, 1972).

> Finding a standard of visual ugliness that would unreasonably disturb a normal, average citizen in the community is no more difficult than finding a standard of olfactory ugliness that would do the same thing (Broughton, 1972).

It is necessary to point out at this time that "in the context of nuisance, courts define aesthetics as embracing only the visual sense" (New York University Law Review, 1970):

> One of the unsettled questions of law is the extent to which the concept of nuisance may be enlarged by legislation so as to give protection to sensibilities that are merely cultural or aesthetic. People v. Rubenfeld, 1930. (Broughton, 1972).

Broughton does not feel, though, that nuisance law is the most likely area in which aesthetics will "find its way into the law as a legally protected interest" (Broughton, 1972). The New York University Law Review expresses the need for what it calls "an aesthetic nuisance action [which] would allow ... private citizens and public officials alike to examine on an individual basis those activities which threaten the scenic resources" (New York University Law Review, 1970).

Zoning and the case of eminent domain is another area in which aesthetics has been dealt with in the courts. The first case that comes to mind is Berman v. Parker (1954) in which a slum clearance project caused the plaintiff's department store to be condemned for the purpose of restoring the area. "The exercise of public control was challenged, in part, because plaintiff's department store was not in fact blighted slum housing but was merely inconsistent with comprehensive planning for the area, planning based, in part, on aesthetic purposes" (Leighty, 1971). The court held that:

> The concept of the public welfare is broad and inclusive ... the values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well-balanced as well as carefully patrolled (Berman v. Parker, 1954).

The power of eminent domain was exercised and the court ruled that the department store would be removed.

Berman v. Parker does not represent the majority of cases dealing with zoning and aesthetics, however. Leighty describes the general trend:

> Courts have not been unaware of the importance of community appearance, but until recently they have strongly questioned whether this societal interest falls within the ambit of 'general welfare.' Hence, exercises of police power have normally been sustained, if at all, only when they also served public morals, health or safety (Leighty, 1971).

This is directly parallel to the distinction between sight nuisances, and smell and noise nuisances described above. Leighty questions the realism of this "traditional approach" in view of "an expanding population with increased needs for space organization and quality surroundings." He continues, saying:

> If 'reasonable aesthetic satisfaction' is one of the minimum requirements for an adequate environment, then emphasis on safety and public health to the exclusion of visual protection could lead to a sterile and insipid existence and a loss of 'public happiness.' Moreover, recent cases have upheld the direct application of general welfare as a sufficient basis for exercises of state police regulations concerning resource use. In light of the observation that aesthetic objectives are drafted into these regulations with increasing frequency, it would seem appropriate for courts to begin to sanction aesthetics as a separate and independent basis for public environmental controls. This would open the door for the development of meaningful aesthetic standards unfettered by traditional health, morals or safety concepts (Leighty, 1971, footnotes deleted).

Again we come back to the issue of the need for standards of aesthetics, without which the courts, for the most part, are forced to rely on "health, morals or safety" or "economics" in defending aesthetic quality:

> The courts obviously have not decided conclusively that aesthetics alone are sufficient grounds for the exercise of police power but the trend is clearly moving in that direction. However, the courts in most instances still associate aesthetics with economics (property depreciation). While this association may be justified, it begs the question of aesthetics as a legal principle. Masotti & Selfon, Aesthetic Zoning and Police Power, 46, J. Urban L. 773, 786-88 (1969). (Quoted in New York University Law Review, 1970.)

In order for aesthetics to be an effective "legal principle" with respect to zoning, Broughton feels that aesthetics must be accepted as a value and that some way of measuring the "relative weight to be accorded to it" must be developed. Of the latter problem he says:

> The weight to be allowed for any given degree of ugliness or beauty, in deciding whether that degree of ugliness or beauty justifies a specific interference with private property, requires a reviewing court to define some standard. The standard

> defined should be replicable to serve as a guidepost on the question of just how far a municipality can go in restricting the use of private property (Broughton, 1972).

An interesting sidelight was brought up by Leighty with respect to public control of land use:

> Frequently, however, aesthetic motives are blended with the traditional categories of health or safety and are treated as harmless, incidental community benefits, so long as they are not the dominant objective. In short, an inarticulate aesthetic objective could arguably be stated to have provided the impetus for many areas of natural resource law, particularly land use controls (Leighty, 1971).

This is particularly thought-provoking in view of the current flood of environmental legislation (not that "an inarticulate aesthetic objective" brought this on, but that it was there before a popular concern for the protection of natural resources became significant). If nothing else, this should serve to point out the underlying importance of aesthetics to society as a whole, even in the absence of "standards of beauty." Overall, however, Broughton feels that zoning will not be the most important way for "aesthetics to be introduced into the law":

> Aesthetics and other intangible environmental values may best be dealt with on a more or less case by case basis by an administrative agency having the time to examine and sift public and private interests with regard to these values and having the expertise and inclination to deal with them intelligently ... To impose upon these agencies values, such as aesthetic values, that are not directly a part of their specialties represents a third facet of the response of the law to new values. This is the area where the greatest progress has been made to include aesthetics as a primary factor in the decision making process [the first two being nuisance and zoning] (Broughton, 1972).

Although Broughton feels that this area, which he calls "Administrative Value Systems," is where aesthetics is making the "greatest progress," it is still fraught with the problem of personal bias. In court cases such as the Scenic Hudson Preservation Conference v. Federal Power Commission (1966), courts have intervened to determine whether or not an agency decision took all required factors into consideration, but as in Scenic Hudson, simply remanded the case with direction to reconsider the decision. (After reevaluating the possibilities, the FPC nevertheless decided to go ahead with construction of the controversial power plant in the originally prosposed, scenically beautiful, and historically significant Hudson River Gorge.)

> Ultimately, decisions such as that one must be made by some person, and that person's personal value system will influence his decision (Broughton, 1972).

That this is probably inevitable in the case of aesthetic judgments is expressed by Newsom in a 1969 article entitled "Zoning for Beauty":

> Because concepts of beauty are extremely difficult to articulate or otherwise enunciate, it is argued that they are somehow unprovable, if not unreal, and cannot be trusted or relied upon to serve as effective guides to or limitations on either private or public decision making. Newsom "Zoning for Beauty," 5 New England L. Rev. 1 (1969) at 1-2 (Quoted in New York University Law Review, 1970).

Broughton strongly contends, however, that:

> Nothing, however, is intrinsically intangible. Intangibility--meaning here difficulty of measurement--exists in part because no one has gone to the effort to work out some method of quantification ... the fact [that] no one has tried to quantify these values has resulted in their continuing to be unquantifiable, which has resulted in their continuing to be under or over-valued according to the bias of the administrative decision makers (Broughton, 1972).

The NEPA, Broughton feels, is the most effective approach to making the administrative decision making process meaningful to aesthetics:

> The key to bringing aesthetics and other similar values into the decision making processes is to structure the process to force the decision maker to consider fully all values which society treasures ...

To this end, he feels that the NEPA is a most promising tool for the legal protection of aesthetic values:

> The National Environmental Policy Act has a number of provisions that ought to be helpful in broadening the protection of aesthetic and related values (Broughton, 1972).

In the conclusion to his article, Broughton focuses on societal values and maintains that administrative decision making is the most effective method of responding to those changing values:

> Ultimately, however, it is a question of values; new values, before being woven into the legal fabric, must find support in society as a whole.
>
> Of the three methods for working aesthetic values into the law--common law nuisance, the use of police powers, and legislative requirements placed upon the administrative process--it would seem that the latter provides the best means for success and that the use of common law nuisance presents the most remote chance for success. The most important feature of the new requirements for administrative decision making is that the procedure must now be responsive to all of the consequences of the decision and to changes in the priorities which people of this nation attach to values (Broughton, 1972).

Leighty sees the legal future of aesthetics in the context of a somewhat more traditional role:

> One can expect "public interest" standards for aesthetics to emerge through the process of statutory interpretation ... Thus, it appears to be only a matter of time before the development of an aesthetic common law to foster broad societal goals (as opposed to the narrow interests of individual litigants) will become visible (Leighty, 1971).

Clearly, the legal need for aesthetics in the future is the further definition of responsibility (such as in the NEPA), if not the development of "replicable" standards which can provide a legal basis for the protection of aesthetic values.

Nuisance, zoning, and administrative decision-making are only a few of the legal paths that have been taken for the protection of aesthetic values. The scope of this paper does not permit more than a brief review of the three articles mentioned in the beginning of this section, but enormous amounts of legal material dealing with aesthetics have been written. (See the references listed throughout the above articles.)

The following sections of this report will attempt to show how various aspects of aesthetic concepts have been applied to the development of methodologies for aesthetic analysis, basic theory, and finally, implementation in the planning process. The fragmented interpretation of what characterizes aesthetics attributes in the environment and how these attributes in turn affect man is a recurring theme for concern as the state of the art is reviewed.

V THE USE OF AESTHETIC CONCEPTS IN APPLIED THEORY AND BASIC RESEARCH

In project planning for transportation, waste treatment facilities, public utilities, water resources, parks, and other publicly funded activities, the practical concern for aesthetics stems from two primary sources: the planners' first concern is to ensure the ultimate success or acceptance of the project, by the surrounding community or by the users; the second concern is to meet the requirements outlined in regulatory guidelines for publicly funded projects. The first concern usually initiates an honest attempt by the project planner to at least consider the visual impact of the project. This approach typically relies on the advice of experienced designers in the area. Much to the bewilderment of the planning team, however, this approach does not always succeed in making the project acceptable to the community (e.g., redevelopment in the City of Bath, England).

The second concern, that for meeting regulatory requirements, is the one currently receiving considerable attention. As cited in the preceding section, NEPA requires that "Federal agencies must identify and develop methods and procedures...which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations" (Public Law 91-190, NEPA 1969). Projects using Federal monies or requiring Federal permits are responsive to NEPA, thus placing project planners under agency guideline regulations.

Several attempts have been made in recent years to both quantify and qualify various elements of aesthetics to allow these aspects of a proposed project to be evaluated concurrently with the technical, social, and economic aspects of alternative design proposals. These attempts have been made primarily in the areas of land use planning, forestry, water resources, highway planning, park services, and public utility planning.

The following analysis represents a selective rather than exhaustive review of the literature directed to the needs of these areas of activity. The literature reviewed was selected on the basis of whether it represented basic trends in the art of quantifying aesthetic elements or qualifying aesthetic concepts.

For purposes of analysis the literature reviewed is presented in two distinct sections. The first group of studies can be referred to as Applied Theory.

They have been designed specifically to be used as a tool by planners and decision-makers when attempting to quantify or measure aesthetic attributes in either a visual analysis of the environment or a user preference assessment of visual stimuli. The second major group of studies present Basic Research for aesthetics in the natural environment, the social-psychological environment, and the man-made environment. This research is directed toward providing a better understanding of the unquantifiable, particularly regarding the relationship of aesthetic concepts to physical and social arrangements.

Review of Methods for Measuring and Quantifying Aesthetics

The development, introduced in the early 20th Century, advocating a scientific approach to understanding aesthetics was the forerunner of a recent trend to measure or quantify aesthetics. Since aesthetics and beauty have traditionally been treated as esoteric subjects, especially when considering the visual quality of a planned physical facility, aesthetic considerations often resulted in a "cosmetic attempt" limited by the size of the project budget. An increased concern for visual quality, along with cultural norms demanding "objectivity" by the decision maker, forced the planning and design professionals to provide objective aesthetic impact information that could be compared with "hard facts and figures" from more pragmatic disciplines. This section of the report will review some of the aesthetic quality ranking systems developed.

Three previous studies, all of which evaluated quantitative methodologies, heavily influenced the basic structure of this analysis. These studies are: "An Analysis of Environmental Quality Ranking Systems" by Julius Gy. Fabos (1971); "On The Criteria For and The Possibility of Quantifying the Aesthetic Aspects of Water Resource Projects" by Ron S. Boster (1973); and "A Review of Selected Materials Relevant to Environmental Impact Assessment" by William W. Hill (1973). A review of these studies is highly recommended for persons particularly interested in quantification methodologies. Although none of the analytical techniques presented in the studies mentioned above were completely suitable for this analysis, those parts (i.e., some of the criteria for analysis) that were felt particularly useful for this section of the report are included with appropriate references.

General Analysis Procedure

The methodologies designed to measure or quantify aesthetics are grouped into two basic categories: visual analysis and user analysis. A brief abstract interpretation of each method reviewed will be analyzed against an appropriate set of criteria thus enabling a discussion of some of the strengths and weaknesses in each method. The first category of methods to be reviewed, visual analysis methodologies, can best be described as tools to be used by a planning staff or decision maker to identify aesthetic attributes and forecast changes in the aesthetic characteristics in the environment, and to describe the implications of changes in terms of potential uses of environmental resources and environmental quality standards. Methods in the second category reviewed, user analysis methodologies, are designed specifically for evaluating individual preferences for various aesthetic (visual) stimuli. Both categories are intended to provide information that will assist decision makers and the general public when considering the advantages and disadvantages of proposed planning activities.

The methods in each of the two categories (visual analysis and user analysis) are further divided into subcategories: those that assign numerical (quantitative) values to aesthetic characteristics and those that rank (measure) aesthetic attributes but are nonnumerical. One additional distinction is made under numerical methods; some of the methods reviewed attempt to relate aesthetic considerations to other environmental considerations (i.e., impacts resulting from a change in air quality, land form, water quality; economic impacts; social impacts). These methods are grouped under the title comprehensive environmental analysis methods because aesthetic changes are evaluated concurrently with other environmental changes and weighted or ranked accordingly. The implication of this approach is that trade-offs are made among various impacts during the valuation process thus providing the decision maker with a single solution to the problem statement. Methods that do not interrelate environmental components are designed to assess aesthetic impacts as an independent environmental consideration, therefore providing the decision maker with information that must then be weighed against other impacts identified by some unidentified technique. Methods falling under this category will be referred to as independent aesthetic assessment methods.

Category 1--Visual Analysis Methods

Criteria for Analysis

According to R. S. Boster, "Objective evaluation of any measuring system requires reference to a set of standards, implicit or explicit; in effect how well a system works...if it works at all...is determined by notions of what constitutes a working system." Broadly based criteria are defined as the basis for formulating such judgments as to workability for various systems (Ron S. Boster, 1973). Each method reviewed will be analyzed against the criteria described below. The criteria will be used to point out strengths and weaknesses in each approach and a comparison of these will summarize each category analyzed:

(1) The system should be generated from public experience and as free as possible of the developer's biases (Boster, 1973). (The method should be as objective as possible and should at least reflect knowledge of information generated from studies developed for assessing user preferences.)

(2) The system should cover the full range of aesthetic attributes in the environment including natural and man-made (built) characteristics, unique features, and misfits (i.e., results of human activities, subjectively evaluated as obvious eyesores, such as junk yards or garbage pits).

(3) The factors and variables used should be appropriate to the scale and purpose of the ranking system.

"A ranking system designed to evaluate a large region for the purpose of formulating a land-use policy may necessitate an entirely different set of factors and variables than a system prepared to evaluate a camping site" (Fabos, 1971).

(4) Secondary as well as primary impacts should be considered.

- Primary impacts are changes resulting from the planned activity which directly affect the aesthetic characteristics in the existing environment. (That is, a proposed highway project creates improved access to an area, commercial development opportunities open up, and the aesthetic character of planned corridor changes from natural to built environment.)
- Secondary impacts would include changes in the environment which are encouraged or induced by the planned activity. (A proposed highway that allows commercial development along the corridor might be visible from an exclusive low-density residential area. The change in view could cause property values to drop, open space to be subdivided, and apartments to be introduced; thus population density increases, and visual character and community cohesiveness change.)

(5) Changes or impacts should be measured against an established reference point so that the value assigned to one impact can be compared with the value assigned another impact.

(6) A good technique will be straightforward and easily reproduced by others (planners), and relatively inexpensive to employ. "Persons having skills and training similar to those who develop a technique should be able to reproduce and evaluate it" (Fabos 1971). Likewise, the complexity of the technique and sophistication of the tools used in the system should reflect the resources typically available to the intended users (including manpower, budget and hardware resources).

(7) The output from the system (information generated) should be easily translated and useful as a communicative tool between planner and decision maker; a decision maker and the relevant public.

Additionally, values assigned to impacts or changes should indicate especially sensitive aspects that influenced evaluation (special interest groups, trends in established values, culturally diverse groups).

Numerical Systems for Visual Analysis--Comprehensive Environmental Analysis

Several methods have been designed to identify aesthetic attributes and forecast changes in the aesthetic characteristics of the environment. The numerical methods reviewed here have attempted to measure or quantify aesthetic attributes in the environment by assigning numerical values to identified aesthetic characteristics and forecasted changes.

"An Environmental Quality Rating System"

This comprehensive environmental analysis system, prepared by the Northeast Region staff of the Bureau of Outdoor Recreation (Rolland Handley) is an attempt to quantify quality levels in a portion of the total environmental spectrum. The basic intent is to incorporate all positive value sources, man's and nature's, into an environmental analysis to be used as a tool for making environmental decisions. Numerical values assigned to environmental elements are "arbitrarily selected by the development staff" and are meant to indicate a strong possibility worth pursuing further.

The system originated during the Kanawha River Basin Comprehensive Study, and has since been tested in three different environment types: a small city, a classic suburb, and a rural area.

The approach begins with the selection of eight categories to be rated: residential population, community resources, water resources, land forms, leisure resources, vegetative resources, fish and wildlife, and historical and archeological sites. Categories are then rated (out of a possible 400 points) arbitrarily, using the following criteria: whether they have a high potential for interaction, a high visibility, and the extent of their impact as a result of varying conditions.

Each category is then broken down to factors (ranging from 4 to 6 per category) established by using the following criteria: Man needs variety; The visible elements of the environment are the most significant; and ~~A~~ I system should include as many as possible of those elements demonstrating potential for action and reaction.

According to category points, then, each factor is assigned a base weight by which a total category base value is obtained. Values express positive values as influenced by outside forces.

Four standard base values are used: *optimum* represents assignment of 90% of possible base points in the category; *satisfactory* is 40-89% of base points; *marginal* is 20-39% of base points; and *unsatisfactory* is less than 20% of base points. An additional negative value rating is then applied to each category to account for conditions or influences whose presence degrades or reduces the weighted base value of positive environmental factors (e.g., visual pollution, junkyards, garbage dumps, utility lines, billboards, intense night lights, air pollution, noise pollution, and crowding). The final number derived from application of the base value, weighting value, and negative value represents the environmental quality rating for that environment.

> Definitions presented in the paper (Handley, 1973) are:
>
> *Base value*--the comparative numerical value assigned to each factor to indicate the degree to which it is present in and adds to the environmental quality of a given location.
>
> *Weighting value*--variable multipliers applied to the determined base values on the assumption that the degree to which positive values are present can add value which is beyond that represented by the resource alone.

One example of a factor under the category Community Resources (with a base value of 80) is *visual stability* (20-year trend). It has a base value of 6 out of 80 and is weighted by the way the area considered meets the following standard (Handley, 1973):

> Satisfactory place identity and security is derived from stability of its positive environmental values. Stability can connote addition of positive factors; therefore, stability does not mean stagnation. Stability in a changing environment does not consider size, just the nature of change. Pointless changes from one positive value to another--destroying adequate row houses to create adequate apartments--produce a net loss. They destroy place identity and security.
>
> (Max.) Area has retained its positive values, identity, and preserved its own character.

(Min.) Widespread visual changes appreciably affecting identity usually in a negative manner (Handley, 1973).

Analysis: "An Environmental Quality Rating System" satisfies all of the criteria in varying degrees except for the first one requiring that it be generated from public experience rather than the developer's biases. The fact that values are assigned arbitrarily (with no explanation of how the division of points was established) and factors are selected without reference to user preference studies is stated openly by the author.

> Limited field testing to date leads the authors to believe that they have achieved a balance between the natural and the human values which compose the environment. It does appear possible that an urban area and a rural area could rate about equal. The surface has only been scratched as behavioral scientists have contributed very little to date in identifying social criteria and priorities for inventories; therefore, the authors took a subjective approach and relied somewhat on their own interpretations and assumptions about man and his values (Handley, 1973).

In terms of Criterion 3, the appropriateness of factors and variables for the scale, the title of the system implies that it is broadly applicable, but the scale of the factors indicates that application on a community or neighborhood scale is more appropriate than on a regional or state scale. The factors and criteria in the system reflect the developers' broad definition of aesthetics and the man/environment interaction.

The strong points of the system come under Criteria 5 and 7 (established reference points and easily communicated). Although the vocabulary is professionally oriented, the minimum and maximum qualifications for evaluating each factor are exceptionally well described. Thus, they establish a frame of reference and provide information easy to communicate to decision-makers and the general public. Finally, the development of a process for rerating proposed activities provides very good feedback for checking the direct and indirect impacts caused by the activity and any changes in values.

This system in the author's opinion provides a much clearer definition of aesthetic (particularly visual) quality indicators than a similar study for outlining the environmental quality indices for aesthetics presented in the Mitre report "Monitoring the Environment of the Nation" (1971).

"An Environmental Evaluation System (EES) for Water Resource Planning"

The EES, a comprehensive environmental analysis system devised by Norbert Dee, et al., Battelle-Columbus Laboratories, was developed for the Bureau of Reclamation (1972) to assess environmental impacts of water resource development projects proposed by the Bureau. According to Dee (1972),

> The structure of the EES is hierarchical to allow some resolution of the analytical difficulties stemming from the specialist and the generalist approaches. By organizing specific disciplines into a hierarchy, the problems of measurement are laid out so that the specialists can handle them; but on ascending the hierarchy, the divisions broaden to permit applying the generalists' viewpoint and talents.

The hierarchy consisted of four levels:

- Level 1--environmental categories--contained the most general information.
- Level 2--environmental components--contained less general information.
- Level 3--parameters--contained fairly specific information.
- Level 4--measurements--contained the most specific information (Dee, 1972).

The EES provides for environmental impact evaluations in four major categories: ecology, environmental pollution, aesthetics, and human interest. These four categories are further broken down into 18 components and finally into 78 parameters.

The categories and components developed for the EES for Bureau of Reclamation project evaluations are illustrated in Figure 2.

The relative importance of the parameters expressed in Parameter Importance Units (PIU) are grouped by category and component in the above parentheses. A total of 1,000 PIU are distributed to the 78 parameters in the EES. The system is further explained in the Battelle Research Outlook (1972), as follows:

> The number of measurements taken (Level 4) varied according to the parameter, the project, the size of the area considered, and the judgment of the specialist doing the measuring.

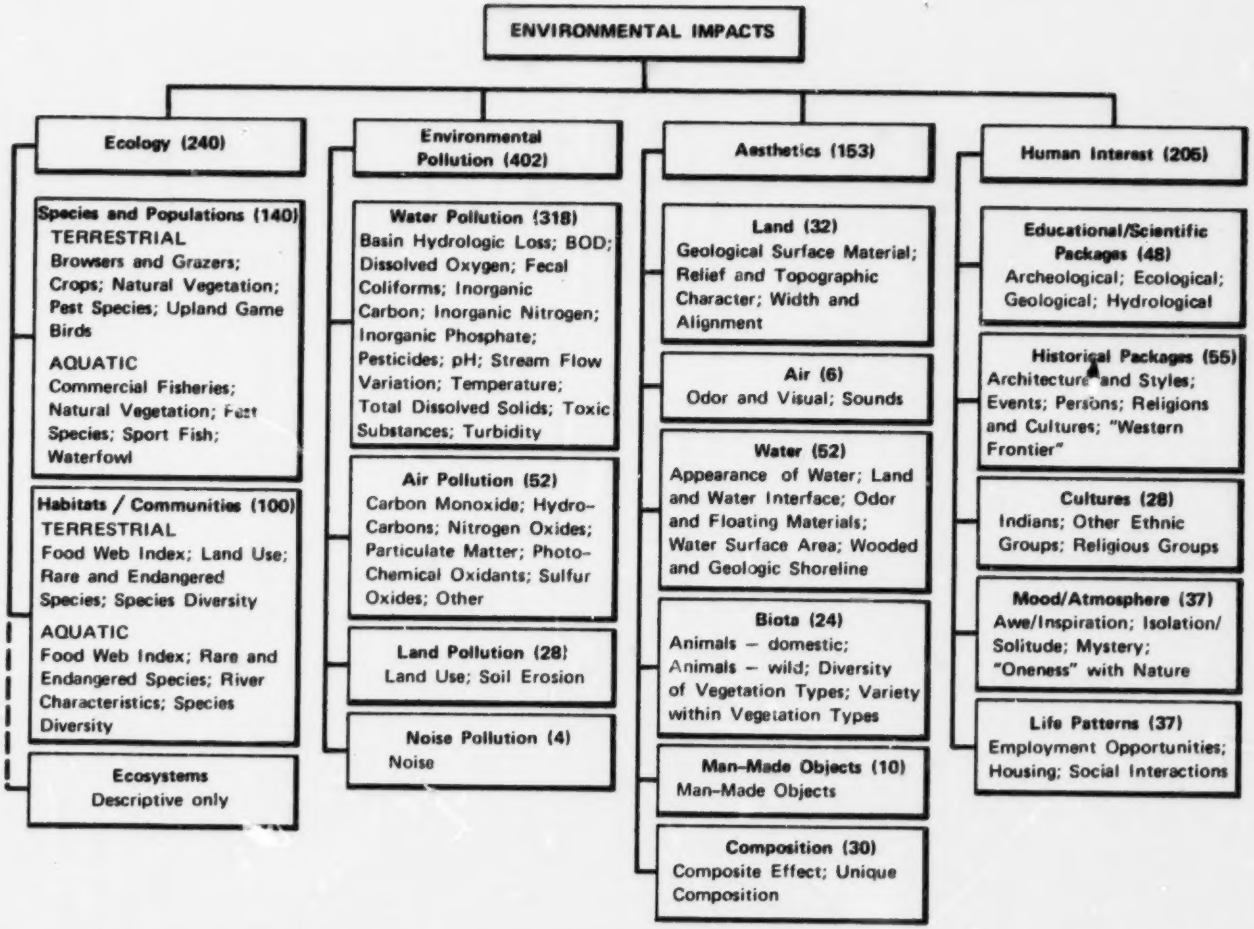

ENVIRONMENTAL IMPACTS
Ecology (240)
Species and Populations (140)
TERRESTRIAL
Browsers and Grazers; Crops; Natural Vegetation; Pest Species; Upland Game Birds
AQUATIC
Commercial Fisheries; Natural Vegetation; Pest Species; Sport Fish; Waterfowl
Habitats / Communities (100)
TERRESTRIAL
Food Web Index; Land Use; Rare and Endangered Species; Species Diversity
AQUATIC
Food Web Index; Rare and Endangered Species; River Characteristics; Species Diversity
Ecosystems
Descriptive only
Environmental Pollution (402)
Water Pollution (318)
Basin Hydrologic Loss; BOD; Dissolved Oxygen; Fecal Coliforms; Inorganic Carbon; Inorganic Nitrogen; Inorganic Phosphate; Pesticides; pH; Stream Flow Variation; Temperature; Total Dissolved Solids; Toxic Substances; Turbidity
Air Pollution (52)
Carbon Monoxide; Hydro-Carbons; Nitrogen Oxides; Particulate Matter; Photo-Chemical Oxidants; Sulfur Oxides; Other
Land Pollution (28)
Land Use; Soil Erosion
Noise Pollution (4)
Noise
Aesthetics (153)
Land (32)
Geological Surface Material; Relief and Topographic Character; Width and Alignment
Air (6)
Odor and Visual; Sounds
Water (52)
Appearance of Water; Land and Water Interface; Odor and Floating Materials; Water Surface Area; Wooded and Geologic Shoreline
Biota (24)
Animals – domestic; Animals – wild; Diversity of Vegetation Types; Variety within Vegetation Types
Man-Made Objects (10)
Man-Made Objects
Composition (30)
Composite Effect; Unique Composition
Human Interest (205)
Educational/Scientific Packages (48)
Archeological; Ecological; Geological; Hydrological
Historical Packages (55)
Architecture and Styles; Events; Persons; Religions and Cultures; "Western Frontier"
Cultures (28)
Indians; Other Ethnic Groups; Religious Groups
Mood/Atmosphere (37)
Awe/Inspiration; Isolation/Solitude; Mystery; "Oneness" with Nature
Life Patterns (37)
Employment Opportunities; Housing; Social Interactions

FIGURE 2 THE ENVIRONMENTAL EVALUATION SYSTEM (EES) APPLIED TO A SPECIFIC STUDY

Level 3, parameters, is the key level at which environmental impacts are experienced directly. Each parameter represents some unit or aspect of environmental significance that merits separate consideration. In selecting the parameters for inclusion in the EES, it was decided that parameters should be: highly comprehensive indicators of environmental quality; easily measurable in the field; measurable on a project scale; and as limited in number as possible while retaining comprehensive character.

Although the parameters were not specifically interlinked, interaction between them was often taken into account by repeating the measurements under different parameters. Noise, for instance, appears as such only under the category of "Environmental Pollution." However, noise measurements would be significant as part of the parameter "Sounds" under "Esthetics," and in most of the "Mood/Atmosphere" parameters under the "Human Interest" category.

To use the EES, measurements must be synthesized into an evaluation of each environmental parameter, the parameters must be joined into measures of the components, the components must be put together into measures of impact on the categories, and, finally, the categories must be integrated into an overall statement of environmental impact. After laying out the hierarchical approach to the EES, the research team established a common scale for characterizing the environmental parameters.

The team attacked this task by transforming all parameter measurements or estimates into corresponding indexes of environmental quality. This index is a number between 0 and 1, where 0 denotes extremely bad quality and 1, extremely good quality. To get the index, a "value function" was set up for each parameter, and then applied to the parameter to get its environmental quality index.

Obtaining the necessary 78 value functions, one for each parameter, was sometimes easy; there are historical measures of environmental quality for some parameters, such as water turbidity. Here quality or lack of it has long been related to the value of the measurement taken. For other parameters, the task was more difficult; association of measurement to environmental quality had been built from scratch--there were no historical antecedents. In such cases, the value function was developed from professional judgments based on best estimates.

> Generating environmental quality indexes was only half the task of developing common units; the other half involved weighting the parameters. Each parameter represents only a part of the total environment. These parts must be combined to provide a picture of the entire system. In doing this it must be recognized that some parameters are more important than others. Consequently, it was necessary to weight the various parameters according to the relative importance they were perceived to have in contributing to overall environmental quality.
>
> This weighting was done by distributing 1,000 parameter importance units among the 78 parameters. Historical weight and current professional judgments provided the bases for distribution. The importance units allotted to the parameters ranged from 31 for "Dissolved Oxygen" (under "Water Pollution" in the "Environmental Pollution" category) to 2 for "Sounds" (under "Air" in the "Esthetics" category). Some 60 percent of the parameters had an importance weighting between 10 and 15.
>
> By summing up the weights given to the individual parameters in each category, weights were obtained for the categories, too.
>
> With the environmental quality index (EQI) and the parameter importance units (PIU) in hand, the two were multiplied to give common environmental-impact units (EIU): EQI x PIU = EIU. This completed the task of evolving common units for all the parameters. (Battelle Research Outlook, 1972)

The EES described in the report provided a means for measuring or estimating selected environmental impacts of Bureau projects in commensurate units, EIU. Results of using the EES include a total EIU score with and without the proposed project; the difference between the two scores is one measure of environmental impact. Environmental impact scores developed in the EES are based upon the magnitude of specific environmental impacts and their relative importance as judged by the interdisciplinary team conducting the research.

According to Battelle (1972),

> Besides getting an overall view of the environmental impact, it's also important to know if any fragile elements of the environment would be disturbed by a proposed project. Examples of such elements are the Redwood Forests, the Everglades, and the Painted Desert. Unfortunately, fragile elements vary from project to project, and there's no special formula to pinpoint them generally.

Thus, each parameter of the EES must be considered to be a potential fragile element that could, for some project, be crucial in determining the magnitude and significance of the overall environmental impact. In other words, the overall impact expression by itself is not enough to characterize environmental impact adequately.

The approach used to identify these potential problem areas was to call out parameters that changed sharply in the adverse direction with "red flags." These "red flags" were calculated by taking the difference in the environmental quality index of a parameter with and without the proposed project present. The weight of the parameter is of no importance in identifying the "red flag;" only the difference in EQI counts.

Besides signaling potential problem areas, the "red flags" can also point out parameters for which there are too few satisfactory data for evaluation. These parameters, then, are areas in which intensive information gathering is needed.

Analysis: The Battelle "Environmental Evaluation System"--has a predominant strength and a predominant weakness for aesthetic assessment. Its strength is the comprehensiveness displayed in the range of environmental factors considered to have aesthetic relevance. The aesthetics category includes air, land, water, biota, man-made objects, and composition parameters. Aesthetics is also an important consideration in the category of Human Interest and Environmental Pollution. An attempt is made to assess such parameters as mood/atmosphere, awe-inspiration, isolation/solitude, mystery, and "oneness" with nature.

The emphasis placed on man's aesthetic needs in addition to the aesthetic balance in nature provides a complete range of aesthetic considerations for environmental quality. Unfortunately, the drawback as the developers themselves recognized, is a system so concerned with evaluating subjective parameters that it is bound to reflect biases. Although Dee and his staff state that representatives from a cross-section of society should assign value functions and weights, they made no attempt to incorporate this aspect into their system. Instead, the value functions and weights published in the report represented the combined judgment of the entire research team, all professional people and probably primarily technicians.

Subjective biases were particularly evident in statements like "The esthetic quality of water depends on its clarity and, in a stream, on its rate of movement. Pure, clean water is most desirable; fast moving white water is considered more visually exciting than slow or static water" (Dee, 1972). The fact that the Red River has a high mineral content does not detract from its beauty, nor does the stillness of Yosemite's Mirror Lake make it unexciting. Without a thorough explanation of how weights are assigned to each parameter and how values contain biases, the information resulting from application of this method would be of minimal use for the decision maker.

One further criticism of the EES system is its failure to consider the interaction among environmental parameters. Changes that occur in one characteristic of the environment are bound to affect other characteristics and cannot be assessed realistically without considering these chain reactions.

"A Procedure for Evaluating Environmental Impact"

This system devised by Luna Leopold in 1971 for the U.S. Geological Survey is, no doubt, one of the most well known methods for environmental analysis. The system utilizes a complex matrix (8,800 cells) to inventory or catalog impacts. One axis of the matrix lists 100 types of actions that can result in environmental impact and the other axis lists 88 environmental characteristics that can receive environmental impacts. Each cell is filled with two numerical indicators from 1 through 9. First, the evaluator indicates the "magnitude" of the impact, using a minus to indicate adverse impacts on a plus for beneficial impacts. Next, the evaluator indicates the relative "importance" of each impact. The term magnitude is used "in the sense of degree, extensiveness, or scale" of the impact; the importance refers to the "significance" of the impact. The intent here is to clearly separate the evaluator's value judgment from the factual material. Matrix cells with high numbers would indicate areas of concern to be documented in the environmental impact statement.

Aesthetics is listed in the matrix along with human interest under the major heading of cultural factors and is subdivided into the following: scenic views and vistas, wilderness qualities, open space qualities, landscape design, unique physical features, parks and reserves, monuments, rare and unique species and ecosystems, historical or archaeological sites and objects, and presence of misfits.

Analysis: Leopold's "A Procedure for Evaluating Environmental Impact"-- has been a major contribution to environmental impact assessment due to its wide circulation and relatively straightforward approach. It is not surprising to find the oversized matrix on many walls in local planning offices, since it is easy to use and at first glance requires little technical expertise. The output is also an efficient tool for communicating impacts to decision makers in addition to the fact that it allows planners an elaborate checklist for identifying critical areas of concern to be covered in the environmental impact statement.

The main fault with the system lies in its very simplicity: A matrix comparison allows cross impacting of variables in a linear fashion, but does not provide an interrelationship of a complex system of environmental factors. Additionally, secondary impacts are not considered, so that even though a wide range of environmental factors (and aesthetic variables) seem to be covered, the true scope is limited. Only first-order changes are indicated (i.e., a change in land form).

The system was developed with no reference to user preference input and does not reflect much sensitivity to the man/environment interaction; it is primarily concerned with physical impacts in the environment.

"An Interstate Corridor Selection Process"

This comprehensive environmental analysis system was devised by Allen Miller and Bernard J. Niemann, Jr., at the University of Wisconsin in 1972 to demonstrate the application of computer technology to highway location dynamics. An article ("Evaluation of Environmental Impact Through A Computer Modeling Process") written by two of the developers, Thomas Krauskopf and Dennis Bunde, explains the system further.

The application of information technology (the computer) to the environmental management process represents a current trend in the art of environmental analysis. The complexity of the interrelationships among environmental factors seem perfectly suited to computerized techniques. The Environmental Awareness Center and the Department of Landscape Architecture have been developing this tool for environmental management for the past four years. This study applies the process to the problem of locating an interstate highway in Wisconsin. The Regional Environmental Management Allocation Process (REMAP) is designed as a four-phase process consisting of: data bank development; determinant establishment; alternative representation; and alternative analysis and selection. Data are tailored to the region under study and are selected objectively rather than interpreted. Data are stored by the computer on a cellular basis, in Phase 1, data bank development. Data are stored under the following hierarchy of variables.

Natural Characteristics (including landscape resources - visual resources)

(1) Hydrological systems

(2) Ecological systems

(3) Physiographical systems

(4) Pedological systems (soil types).

Cultural Characteristics (including cultural resources)

(1) Existing land use patterns

(2) Projected land use systems

(3) Population distribution systems

(4) Communications systems.

Phase 2, determinant establishment, consists of the construction of sets of factors (the determinants) which "should influence the location of the facility under examination." The determinants were selected by an interdisciplinary team made up of representatives of participating agencies. Determinants selected were engineering difficulty, cost of construction, cost of acquisition, projected traffic generation, impact on the cultural system (including incompatibility), impact on the ecological system, impact on quality agricultural land, scenic potential ("The maximization of the landscape's potential to depict the rural Wisconsin scene at interstate-designed speeds through identification of scenic resources and evaluation of the ability to see from the highway"), impact on recreation and conservation lands, development of joint communications corridors.

Each determinant is represented by a linear model, constructed by selecting the data variables which should influence each determinant, grouping these variables into components, and weighting the influence of each variable within a component. "The weighting process relies upon the experience of specialists," according to Miller (1972). The amount of influence of each component can be described either as a percent of the total problem or as the magnitude of influence of the component relative to the other components in the determinant. Finally the determinant modeling process is applied to the data bank creating a spatial value surface for each determinant. The stored information may then be retrieved in the form of a symbolic map where the highest-value cells (represented by the most dense print character) indicate areas most restrictive to highway location under the criteria considered.

Phase 3 of REMAP, alternative representation, entails the combination of the determinants to form "alternative surfaces" upon which an optimal location may be found. Recognizing that any weighting process involves fairly subjective decisions, the developers of REMAP designed the process so that these weights could be set by users in a dynamic fashion. Thus, "at this stage, opinions can freely interact with the process and the resulting value surfaces displayed for analysis." In another aspect of this phase, a dynamic programming model (the "line finder") was developed to select the "lowest effective cost corridor" between two points. The "line finder" was designed to simulate human decision strategy.

The final phase "alternative analysis," consists of finding the effective cost of alternative routes by placing them on alternative or determinant surfaces. For any selection criterion created by the policy maker, a different optimum corridor can be generated by the "line finder."

In conclusion, the use of REMAP for preparing impact statements is advocated by the developers.

Analysis: "An Interstate Corridor Selection Process" using the Regional Environmental Management Allocation Process (REMAP) displays primary strengths in satisfying visual analysis methodology Criteria 2 and 3, full range of aesthetic attributes and appropriate to scale and purpose of system. The factors and variables used in the system are compatible with the intended scope of the analysis. Both "intrinsic" and "extrinsic" landscape resources are identified (these have been defined in earlier work by Phil H. Lewis, Jr. in a 1964 study for the Wisconsin Department of Resource Development), which cover visual resources such as a lighthouse, natural bridge, rifle range, canal, log cabin, old fort, antique ship, rare track, old cemetery, and the like. Thus, the amount of data easily manipulated by computer technology allowed for considerable detail in the analysis, particularly suited to corridor studies. This positive feature leads into several problem areas, however, the first of which addresses Criterion 1--who selects the variables and determinants for the system?

REMAP was entirely designed by an interdisciplinary team "representing expert judgments" from the Environmental Awareness staff, the Wisconsin Department of Transportation divisions of highways and planning, and the Federal Highway Administration. This group developed determinants and established variable combinations and respective weights placing a heavy emphasis on the cost effectiveness factors. Public participation is advocated but not used in this study.

Other problems with data manipulation and computer modeling efforts are the obvious limitations of linear combinations of variables and determinants and the failure to consider parameters which are not amenable to quantification (Hill, 1973). Aesthetic considerations are therefore limited to counting visual objects or distinctly desirable scenes, the "worth" of these objects is limited to assessing how well they enhance the driving experience.

Criteria 6 and 7 (system straightforward, easily reproduced--output useful to decisionmaker) are violated by REMAP in that the system is very complex, depending on manipulation of a large amount of data (132 data bank variables requiring over 6,000 man-hours of student help for data extraction alone). The computer graphics (maps) are easy to read at first glance but communicate poorly to the decision maker because they fail to describe where personal biases influenced the information entered into the system.

Computer technology is advancing rapidly in the art of environmental assessment, therefore, it is extremely important to openly debate the issues critical to its development. Information systems are extremely useful for analyzing intricate systems, and should be encouraged but only under carefully defined conditions. Attention should be paid particularly to limitations on the type of aesthetic data that are amenable to computer analysis.

"Systems Approach to the Evaluation of Benefits From Improved Great Lakes Water Quality"

This methodology developed by Dale D. Meredith and Ben B. Ewing at the University of Illinois, is based on the benefit/cost analysis approach. Municipal and industrial water supply, recreational use, commercial fishing, and aesthetic enjoyment are the basic components in the analysis. The effects of a change in water quality in the Great Lakes in terms of annual costs and benefits are outlined for each of the components. A mathematical model is presented which can be solved to determine the benefits for a change in water quality when the level of water quality before and after the improvement is shown.

The objectives of the study were (1) to determine the feasibility of evaluating the economic benefits which might accrue from improvements in the quality of water in the Great Lakes due to pollution abatement practices and (2) to develop feasible methodologies for evaluating these benefits.

The study method included the following steps: (1) inventory of the data pertaining to the problems available from various Federal, state, and local agencies and private sources; (2) review of the literature pertaining to water resources benefit evaluation as a means of establishing the state of the art; (3) organization of free discussion by a team of qualified experts in various pertinent disciplines in an effort to expose all the questions which must be answered in determining the benefits involved; and (4) working out methods for answering these questions.

The study was concerned with assessing benefits expected to result from changes in water quality variables at specific points of use. Changes in dredging practices were used for analysis. The scope of the analysis was limited to "at point" assessment of water quality, relatively small changes in the direction of water quality improvement, and an assumption that benefits would have to be reevaluated at ten-year intervals to reflect changing economic values.

Benefits of pollution abatement are analyzed in a systematic way. First, the system is defined by identifying and describing the boundaries in as much detail as possible. Second, the elements of the systems are described and delineated for interrelationships and interaction. Third, objectives and criteria for optimum performance of the system in achieving the objectives are outlined. Next, alternative approaches for achieving objectives are developed and evaluated in terms of criteria established. Finally, alternatives are presented to the decision makers for selection of the best course of action.

The paper goes on to propose various methodologies for obtaining the interrelationships and interactions necessary for applying the proposed mathematical model to particular water uses, (see Figure 3). In each case the horizontal pathway represents the interrelationships which the methodology must define in order to evaluate the benefit of water quality improvements. Changes in water quality are reflected by a sequence of changes across this horizontal pathway. The external factors are considered essentially independent of water quality changes and are shown as vertical inputs. In the case of aesthetic benefits, the dotted lines represent that portion of the evaluation which is considered by the authors, not feasible to quantify. For purposes of this paper only the recreation and aesthetic benefit components of the system will be reviewed.

The authors claim that "the extent to which recreational use of water is deleteriously affected by pollution, or conversely, the extent to which recreational use of water is increased by improvement in the quality of water has not been well identified because of many variables which are difficult to measure, either individually or as an interacting group" (Meredith, 1969). Though the recreational use of water resources does not result in an economic benefit, benefits from pollution abatement practices can accrue to recreational use of the Great Lakes in the following ways: (1) by an increase in the unit value of the recreational experience, and (2) by an increase in the number of people participating in water-oriented recreation.

The methodology for assessing recreation benefits deals only with the measurement of tangible benefits and does not include the increase in the

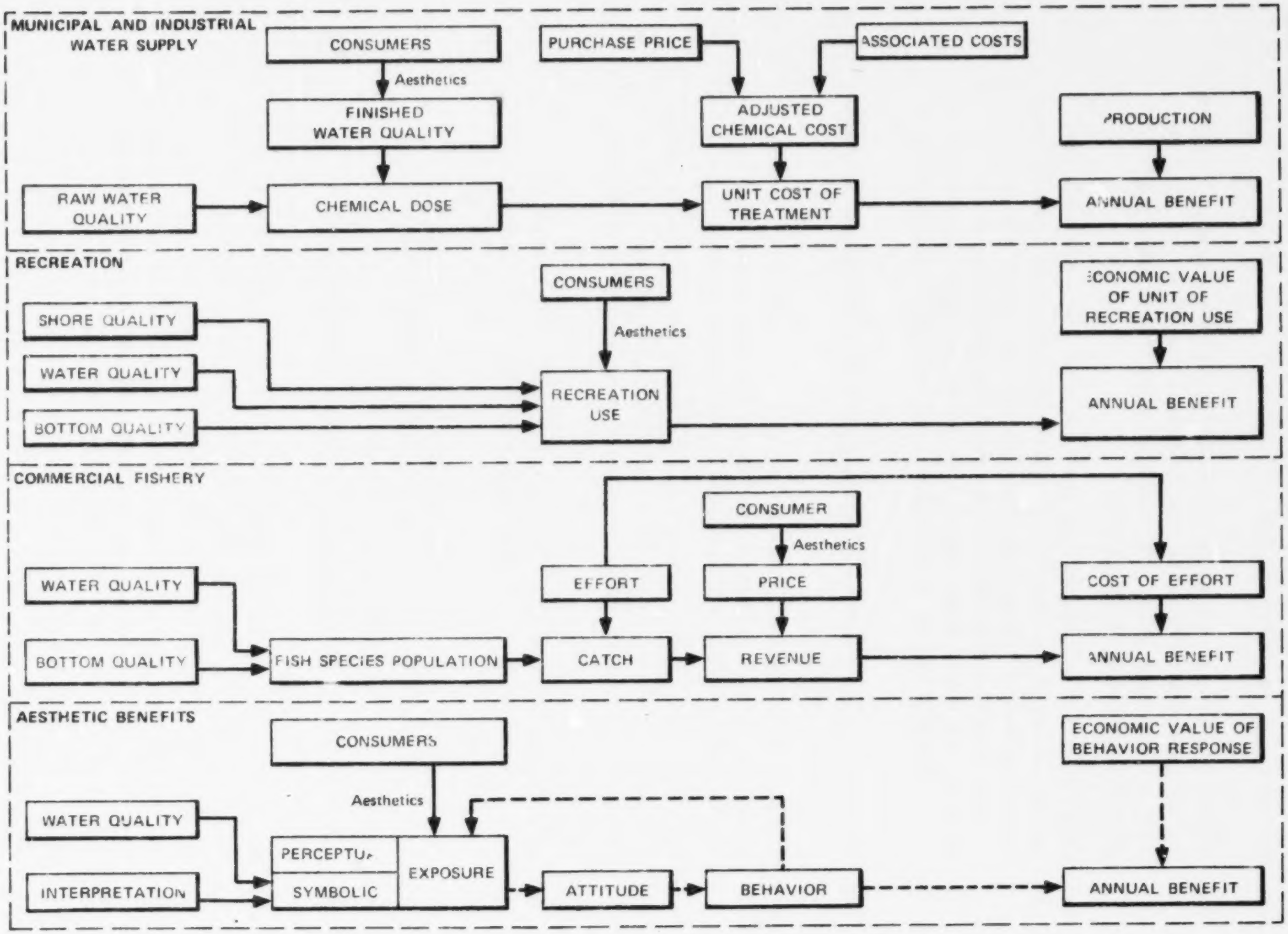


FIGURE 3 BENEFITS FROM IMPROVED WATER QUALITY

unit value of the recreation experience. The 12-step method for evaluating economic recreational benefits follows:

(1) Determine levels of water quality variables (i.e., coliform bacteria) which describe the suitability of water to support recreation uses. A panel of experts is used for determining threshold levels.

(2) Determine the different recreation uses (activities) and potential uses in the water resource area, and locate the existing and potential recreation use sites in the area (i.e., direct body activities such as swimming, skin diving; indirect body contact such as boating, hunting; and non-body (sic!) activities such as sight-seeing and camping).

(3) Determine the level of each water quality variable at each recreation site.

(4) Compare the levels of the water quality variables determined in Step 3 with the levels of the water quality variables established for each activity in Step 1.

(5) Estimate the effect of different levels of the water quality variables on recreation participation at each site, assuming each site has an optimum annual carrying capability.

(6) Determine the level of the water quality variables that would be attained if pollution abatement practices were followed.

(7) Determine the recreation participation at the site for the original level of water quality variables as a percent of the optimum carrying capacity.

(8) Repeat Step 7 for the improved level of water quality variables.

(9) Determine the increase in recreation participation at the site attributed to the improvement in water quality as a percent of optimum carrying capacity.

(10) Calculate the number of recreation days attributable to improved water quality by multiplying the optimum carrying capacity of the site by value obtained in Step 9.

(11) Establish a monetary value attributable to increased participation in a given activity at a given site as a result of water quality improvement. Increase in

recreation days at site multiplied by a monetary value per recreation day as authorized by the U.S. Congress in 1964.

(12) The total annual benefit attributable to increased participation in recreation in the Great Lakes as a result of water quality improvement is equal to the values for each activity at each site determined in Step 11 summed for all activities, all sites, all sections, and all lakes in the system for a period of a year.

The lack of reliable methods for projecting recreation demand and allocating monetary values to recreation activity are pointed out by the authors as weak links in the approach for assessing recreation benefits for improved water quality.

The methodology proposed for assessing aesthetic benefits is as follows:

(1) Determine the exposure of persons to the water conditions including the number, kind, characteristics and amount of exposure of persons with the Great Lakes.

(2) Determine the aesthetic and evaluative responses to the exposure. Responses are measured individually by using the Semantics Differential technique and values are considered within personal, societal, environmental, and the specific water quality context. Aesthetic assessment is made by the variation in aesthetic responses and the degree to which people view their values as being promoted by or blocked by a given level or change in water quality.

(3) Determine the behavioral and economic outcomes as a result of the aesthetic response. These include effects which are implicitly reflected in other benefits such as those connected with real estate site selection and recreation use preferences. "The economic value of the aesthetic component is thereby represented even if it is not specifically identifiable or directly estimated" (Meredith, 1969). The author claims that these benefits are not measurable because we haven't developed techniques to measure them yet. Also included in this category are responses related to water quality that have an unpleasant or pleasant 'feel' but do not have any obvious relationship to overt behavior. These social values are not amenable to economic figures, states Meredith.

However, some approximate estimates between aesthetics and economics behavior are listed. These include the costs incurred in the media (radio, TV, newspapers) to discuss aesthetic aspects of the natural environment; research costs for aesthetics and premiums paid by people for scenic views in real estate.

The study concludes by stating that the aesthetics of the matter cannot be included when public policy decisions are made solely on the basis of economic considerations because there are no numbers to guide, nor formulas to follow.

Analysis: "A Systems Approach to the Evaluation of Benefits from Improved Great Lakes Water Quality" is reviewed for the sole purpose of showing the limitations of attempting to apply benefit/cost techniques to aesthetic assessments given the present state of the art for aesthetic quantification and understanding. The developers fully realized that only the tangible elements such as the numbers of people exposed to a facility and an indication of how people responded to exposure given a change in water quality could be determined. Any attempt to link behavioral and economic outcomes of the aesthetic quality are severely limited. Instead further research in the area of socio-psychology was suggested. The "willingness to pay" approach is limited to news media and real estate analysis.

Evaluated with the criteria for a workable system this study displayed its most positive feature by showing the interrelationship among water quality variables and water related uses of aesthetic relevance. It did not, however, attempt to relate water quality conditions along with other environmental factors (such as vegetation, air quality, noise) to assess the effect on use of multiple pollutants acting at the same time in the same location. Secondary or induced activities are suggested for economic assessment (i.e., real estate values) but are not developed to the full extent possible for aesthetics. The recreation component in comparison is systematically outlined and well described although it is not quite clear as to how the distinction between aesthetics and recreation is made.

The severe limitations on data for economic analysis of aesthetic characteristics concerning water quality does not offer the decision maker much help when evaluating a project. The methodology is incomplete in the area of aesthetic assessment procedures but is a useful example of the problem encountered when attempting to attach dollar values to highly subjective evaluations.

An article by the Bureau of Outdoor Recreation (Fitch 1970) supports this by stating,

> Money measures in relation to questions of public acquisition and development of outdoor recreation resources are relevant, but the degree of relevance varies, and they are only part of a much larger story. If the problem is one of decision as to whether money should be allocated to finance the restoration of a dying lake or stream or shore line, the solution of the problem should begin with an appraisal, in both qualitative and quantitative terms, of the effect of the pollution on the life, liberty, and happiness of the citizens who are affected by it. If civilization and sanity persuade us that we should restore the stream, the lake, or the shore line, the next question is "Can we afford it?" and not "What percentage of cash return can we expect from an alternative investment?"

Fitch goes on to describe the limitations of using the willingness to pay for environment factors that are not a marketable commodity, such as sunshine and scenery. Economic theory is based primarily on the value of ownership and scarcity concepts. Outdoor recreation emphasizes values for which the true scale is qualitative, not quantitative--a scale of pricelessness rather than a price, encouraging a policy of protection rather than consumption.

> If all human beings interested in a given land problem were identical statistical units, if there were no significant variations in their reactions to beauty, if they possessed the same standards of judgment as to the content of the good life, then and then only could their characteristics, their needs, and their desires be measured with the precision required for a determination of the arithmetical net of advantage and disadvantage (Fitch, 1970).

Fitch goes on to warn those who insist upon consigning dollar values to such things as the purity of air and water that such measurements would tend to sanction the destruction of the land and the pollution of air and water wherever and whenever destruction and pollutons could be shown to be profitable. It is a false premise to believe that the best way is always the cheapest and that the most worthwhile alternative is the one that yields the highest net return.

The article concludes by saying:

> Reliance upon judgment requires an awareness of the limitations of quantitative evidence, not its abandonment. It means an extension of the logic of choice beyond measurement to include a consideration of the aspirations of mankind and the content of the good life. Outdoor recreation, from the establishment of Central Park to the latest public acquisition of California

> redwoods, depends upon the victory of the priceless over that which is priced. It is possible that the preservation of mankind itself will require many more such victories (Fitch, 1970).

This is not to say that aesthetic factors are entirely adverse to economic analysis, but that the present state of the art for understanding and quantifying aesthetics is not yet at the point where dollar values can be assigned in a reliable way. Studies for identifying variables in the environment that can be attributed to affecting man's aesthetic experiences, thus influencing his actions (i.e., "willingness to pay," investments in both time and money, real estate values, leisure activities) are yet to be developed.

Summary of Comprehensive Environmental Analysis Methods

Although the methods reviewed above represent only a select few of those developed, they are presented for their ability to represent various analytical approaches: environmental quality indicators, systems analysis, matrix identification, computer analysis, and cost/benefit analysis. References to other methods falling under this category are listed in the selected reading list at the back of this report.

Using the criteria outlined in this report for analysis, the methods reviewed can best be summarized in Table 1.

Numerical Systems for Visual Analysis--Independent Aesthetic Assessment Methods

The following methods apply numerical values to the identification and assessment of aesthetic (or visual) characteristics in the environment, but do not attempt to make a comprehensive analysis of all environmental characteristics. Therefore, their usefulness for decision making is somewhat restricted because they have a limited scope for analysis (aesthetic factors only). Information generated from application of these techniques must be transferred to usable form when considering trade offs for any project decision.

"Quantitative Comparison of Some Aesthetic Factors Among Rivers"

This method, described by Luna B. Leopold (1969) is, no doubt, the published aesthetic quantification methodology most often referred to. Leopold's approach was developed specifically for the purpose of determining whether

Table 1

VISUAL ANALYSIS METHODS
NUMERICAL-COMPREHENSIVE ENVIRONMENTAL ANALYSIS METHODS

Criteria	Bureau of Outdoor (Handley) Recreation (Indicators)	Battelle (Dee) (System approach)	Leopold (Matrix)	REMAP (Miller) (Computer)	Meredith (Benefit/Cost)
(1) Generated from public experience, not developer's biases	(-) Subjective-selection of factors intuitive	(-) Biases of staff obvious in weighting scheme	(-) Developer selected variables of importance	(-) Influenced by highway team members. Cost effectiveness predominates.	(-) Team of experts used for development, not tested on users
(2) Full range of aesthetic attributes	(+) Very detailed and comprehensive--emphasis on man/environment interaction	(+) Aesthetics well interrelated with other environmental factors	(-) Emphasis on physical features not man/environment interaction	(+) Cultural resources adequately described	(-) Water quality was the only parameter used
(3) Variables appropriate to scale and purpose of system	(+) Location oriented (town, street, neighborhood)	(+) Corridor related, several miles	(+) Site related	(+) Highway corridor scale	(+) Site related
(4) Primary aesthetic and secondary aesthetic impacts considered	(+) Sensitive areas for induced activities are identified	(-) Only primary impacts considered. Impacts not interrelated	(-) Primary only, not interrelated	(-) Primary only--no interactions shown	(+) Induced activities suggested for consideration
(5) Measured against established reference point	(+) Maximum and minimum levels of aesthetic conditions outlined	(-) Pairwise ranking no indication of reasons for initial weights	(-) Each factor rated independently	(+) Determined by number of factors in each cell	(+) The dollar-willingness to pay
(6) Straightforward and easily reproduced	(+) Would require professional to apply system and interpret information	(-) Professionally dependent	(+) Easy to use, very adaptable to planning situation	(-) Expensive and complex data collection	(-) Not really complete in aesthetics
(7) Output easily communicated	(+) Diverse cultural groups identified, useful output easily understood	(-) Hidden values in weights misleading for decisionmakers	(+) Indicates critical areas for EIS	(-) Hidden values not identified well	(-) Aesthetic dollar value not clearly understood

Note: (-) indicates that the system does not satisfy corresponding criteria
(+) indicates that the system satisfied criteria adequately.

the Hell's Canyon of the Snake River was unique aesthetically when compared with other canyons, based on the following premise: "Landscape which is unique--that is, different from others or uncommon--has more significance to society than that which is common. The unique qualities which enhance its value to society are those which have some aesthetic, scenic, or human interest connotation." Leopold presents a preliminary attempt to "quantify some elements of aesthetic appeal while eliminating, insofar as possible, value judgment or personal preferences." Leopold claims that by assigning quantitative estimates to aesthetic factors, his approach leads to relative rank positions of factors rather than ratios of values.

The Hell's Canyon analysis considered three types of factors aesthetically relevant: physical features, biologic features, and human interest factors. A total of 46 items were ranked under the three types of factors. Each item was then assigned a numerical position on a comparative scale which represented the degree of presence or absence of that factor for the area being studied (twelve sites were evaluated). "All factors were assumed to range through a span of five degrees or categories. The physical factors which could be measured were divided by a geometric scale into the five categories." As pointed out by Hill (1973) in his review of the method, a "uniqueness ratio," which is defined as the reciprocal of the number of sites sharing a particular category value, was calculated for each site and for each of the 46 factors. A "total uniqueness ratio" for each site was obtained by adding up the uniqueness ratios for all 46 factors; in this way, each factor was weighted equally.

Uniqueness, described by Leopold, might also apply to something which is uniquely bad. Therefore, the ranking scheme consists of two parts which separately determine (1) the relative uniqueness whether the unique qualities have aesthetic, scenic, or human interest connotation or not, and (2) the relative uniqueness when the unique qualities are arranged in hierarchical order of aesthetic interest or are chosen to do so. Thus, a site which has a sluggish, algae infested, murky stream might be unique in the categories of physical and biological factors but would not rank high in human interest.

Once factors are ranked, the data may be used to make site comparisons. This is done by grouping factors selected to represent particular aspects of the landscapes. "Although selection of factors involves judgment as to which factors appropriately describe certain landscape characteristics, grouping of selected factors need not involve assignment of preference." Group factors used in the Hell's Canyon comparison were landscape scale (spectacular scenery, bigness or grandeur), degree of urbanization, degree of wildness, river characteristics. Hell's Canyon, as compared to the other twelve sites was uniquely in a category of its own with respect to the character of the valley and river, thus had exceptional aesthetic quality. When compared on a broader scale it still was clearly unique and comparable only to the Grand Canyon of the Colorado River.

Analysis: "Quantitative Comparison of Some Aesthetic Factors Among Rivers" depends heavily on personal preference. When Leopold states that "experience indicates that the grandeur or majesty of a river is dependent on a combination of size and apparent speed....Small rivers tumbling over a succession of falls are more impressive or are more aesthetically appealing than a large river which appears sluggish," he fails to clarify whose or what "experience" led him to this conclusion. Huck Finn, on a raft, would not have considered a large river unexciting. The most subjective part of Leopold's approach (i.e., preferred landscape character) is evidenced when "defining human interest." The addition of user preference studies, could add considerable validity to the uniqueness methodology.

Leopold's experience, on the other hand, shows itself well in his selection of factors for comparison. The list of 47 factors is comprehensive, and well suited for site analysis of river canyons. The method adequately covers natural, man-made, unique, and misfit features. Since the same list of factors is quite specific and reflects a wilderness area it is not applicable to other types of analysis (a waste treatment plant site analysis in an urban area for instance), without considerable modification; its application, therefore, is limited.

The method fails to satisfy Criterion 5 (common reference point) because each site was evaluated separately--there was no indication of an evaluation reference point, so if one river was ranked "foamy" with only minor evidence of foam, how would a "very foamy" river be ranked?

In conclusion, Leopold's work has significantly contributed to the art of aesthetic measurement. His techniques are exceptionally suited to the resources available to most planning offices. Although they are dependent on interdisciplinary technical input, they do not require exorbitant amounts of data, or expensive processing. With the addition of substantiating evidence of human interest, this method could be a useful tool for planning offices and decision makers when considering resource development in a rural or wilderness area.

"A Method for Classifying Scenery from a Roadway"

This method, devised by Hubert D. Burke, et al., was designed to provide U.S. Forest Service planners with a method for appraising scenic values for forest highways and other secondary roads. Burke begins by referring to several studies that have been conducted to appraise scenic values, and goes on to present a method closely aligned to a classification technique developed by Harrison (1962).

The objective of Burke's method is to supplement a method developed for evaluating scenery through photographs, sketches, and maps by providing useful terms for recording, communicating, and comparing scenic values. The methodology is designed to evaluate scenery along a roadway on the basis of how a single view deviates from a "characteristic landscape." A "characteristic landscape," according to Burke, is "one that occurs most of the time--the average condition." Each single view is further divided into a far zone, an outer zone, and a roadside zone (Figure 4). Each zone is rated as follows:

+1 = view has elements of natural or man-made beauty or interest that are superior to the characteristic landscape.

c = view represents the characteristic landscape.

-1 = some work of man in the view detracts from the characteristic landscape.

N = some work of man in the view is nontypical of the characteristic landscape, but it is neutral or attractive in beauty or interest.

X = zone is not visible.

These ratings are admitted to be subjective, but the use of "characteristic" landscape is claimed to provide for consistency between observers.

Burke goes on to portray pictorially five types of landscapes: high plains, irrigated farm land, mountain canyons, high mountain forest land, and Southwestern pinyon-juniper. The rater is to ask himself "Is this one of the variety of views that typify this landscape? Is this average? If the answer is yes it gets a (c)." If the view is thought to be one which a tourist might photograph, the scene gets a (+1). Structures in the landscape are likewise rated. If the structure detracts (a dump or house in disrepair), the zone is rated -1; if it is neutral (the example used is an oil tank on an open plain) the zone is rated N; and if the structure adds to the charm of the scene (a historical building) it is rated +1.

Burke concludes by stating that "these scenic ratings in conjunction with a map (although subjective) can provide useful route summaries, and with the addition of proper sampling techniques (beyond the scope of this study), could be used to quantify and compare scenic values along existing or proposed routes."

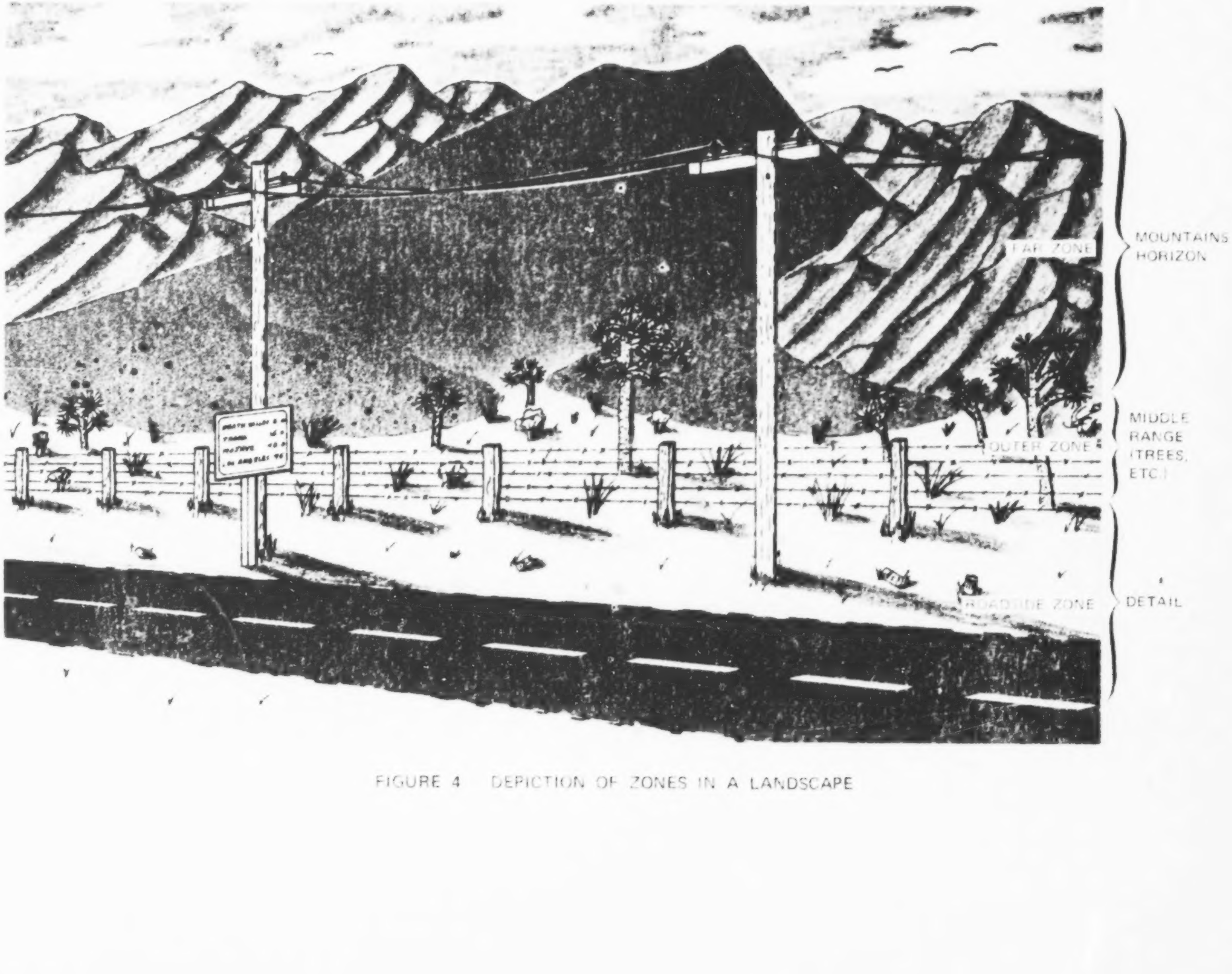


FIGURE 4 DEPICTION OF ZONES IN A LANDSCAPE

Analysis: Although the author of "A Method for Classifying Scenery from a Roadway" states openly that the ratings are designed to be assigned to views subjectively, he refers to studies of user's preferences, and indicates that these should be used for verifying his evaluation. The technique, which relies heavily on the use of photos, is straightforward and easily reproduced. Burke's explanation of the way views are divided into zones and then each zone is rated against a characteristic scene is easily communicated. The real problem lies in trying to determine scenes which deviate from the norm, particularly when structures are involved. What one person might call neutral (the author's example was an oil storage tank in an open plain), another person might label an eyesore. Burke's hint for developing sampling techniques to test the rating in this method seems essential for its implementation.

"VIEWIT"

A new computerized technique is described by Gary H. Elsner in his article "Computing Visible Areas from Proposed Recreation Developments" for the USDA Forest Service (1971).

VIEWIT is a technique designed to measure the amount of terrain visible from a given point realizing that the amount of visible area is often an important consideration in judging the feasibility of proposed recreation developments in National Forests. VIEWIT was applied in a study on the Black Hills National Forest, South Dakota. The scenic vistas from 12 heavily visited scenic points in the area and along three proposed scenic tramway routes were delineated. In each of the twelve cases the number of acres visible from a development were computed. Additional information, such as the number of times a vista was seen from various observation points, was depicted with overlay maps.

The procedure for using VIEWIT is as follows: First, the topography of the area is digitized and recorded as elevation points on data cells. Each of the elevation points (45,152 in the case study) represents about 3.1 acres, with the elevation recorded to the nearest 100 feet. Next, elevation points were individually analyzed as observer positions by checking the number of other cells visible from this point (the calculation process is programmed). Using the same approach, the visible area along each of the three proposed tramway routes is computed by doing a single-point analysis at each point along a route. Resulting information is presented graphically on overlay maps that show the maximum area visible from each observation point. In the case study for instance, 101,016 acres or 72.17% of the total area analyzed was visible from the top of Harney Peak. Of this total visible area, 72.886% was within a 6-mile radius.

A carefully controlled data collection and programming effort is required for VIEWIT, but once the data has been stored it needs to be updated only infrequently. Information generated from VIEWIT helps define visible areas both of and from sites for proposed projects.

Analysis: VIEWIT is designed as a tool for recording the number of point-to-point views possible from given observation points. It is based on objective data (elevations from a topographical map) and it does not evaluate the views, it merely calculates which views are within the range of human vision. Though objects or aesthetic attributes are not identified the technique has potential for use in identifying visible areas. The approach seems most appropriate for mountainous or hilly regions.

This method is straightforward and would not be difficult to reproduce given a staff member who can read topographical maps and record data in computer format, plus having access to computer hardware for compiling the data. The graphic maps are easy to interpret, allowing the decision maker limited but useful data for specific planning decisions.

Summary of Independent Aesthetic Assessment Methods

The above methods represent various analytical approaches for assessing aesthetic attributes in the environment. Use of these methods is limited in that they consider only one factor of the total environmental analysis. Analyzed with the criteria outlined previously in this section the methods reviewed are summarized in Table 2.

Nonnumerical Visual Analysis Methods

The following methods do not attempt to assign numerical values to aesthetic attributes but do address the problem of identifying and ranking aesthetics.

Litton Method

R. Burton Litton, Jr. has developed an approach for assessing the aesthetic characteristics in a landscape. He has applied his basic framework for analysis in several studies, including "An Aesthetic Overview of the Role of Water in the Landscape" for the U.S. National Water Commission (1971), "Aesthetic Dimension of the Landscape" for the U.S. Forest Service, and "Forest Landscape Description and Inventory--a Basis for Land Planning and Design" for the U.S. Forest Service (1968).

Table 2

VISUAL ANALYSIS METHODS
NUMERICAL-INDEPENDENT AESTHETIC ASSESSMENT METHODS

Criteria*	Leopold's Uniqueness Study (numerical scale)	Burke (photographs)	VIEWIT (computerized)
(1) Generated from public experience not developers biases	(-) Subjective selection of preferred characteristics	(-) Developers biases define beauty and interest	(+) Totally objective, only areas physically visible are computed
(2) Full range of aesthetic attributes	(+) Aesthetic factors considered in detail, good range	(+) Full range indicated	n.a. Objects not described
(3) Variables appropriate to scale and purpose of system	(+) Site related	(+) Views by zone--corridor related	(+) Site related
(4) Primary aesthetic and secondary aesthetic impacts considered	(-) Primary only	(-) Sensitive areas not adequately described	n.a.
(5) Measured against established reference point	(-) Ranked independently	(-) Characteristic landscape not described well	(+) Is it visible or not
(6) Straightforward and easily reproduced	(+) Data appropriate and adequately described	(+) Photos primarily	(+) Topo map reading and computer data
(7) Output easily communicated	(-) Ranking criteria not explained well	(-) Subjective values predominate	(+) Informative but limited in usefulness

*Note: (-) indicates that the system does not satisfy corresponding criteria
(+) indicates that the system satisfies criteria adequately.

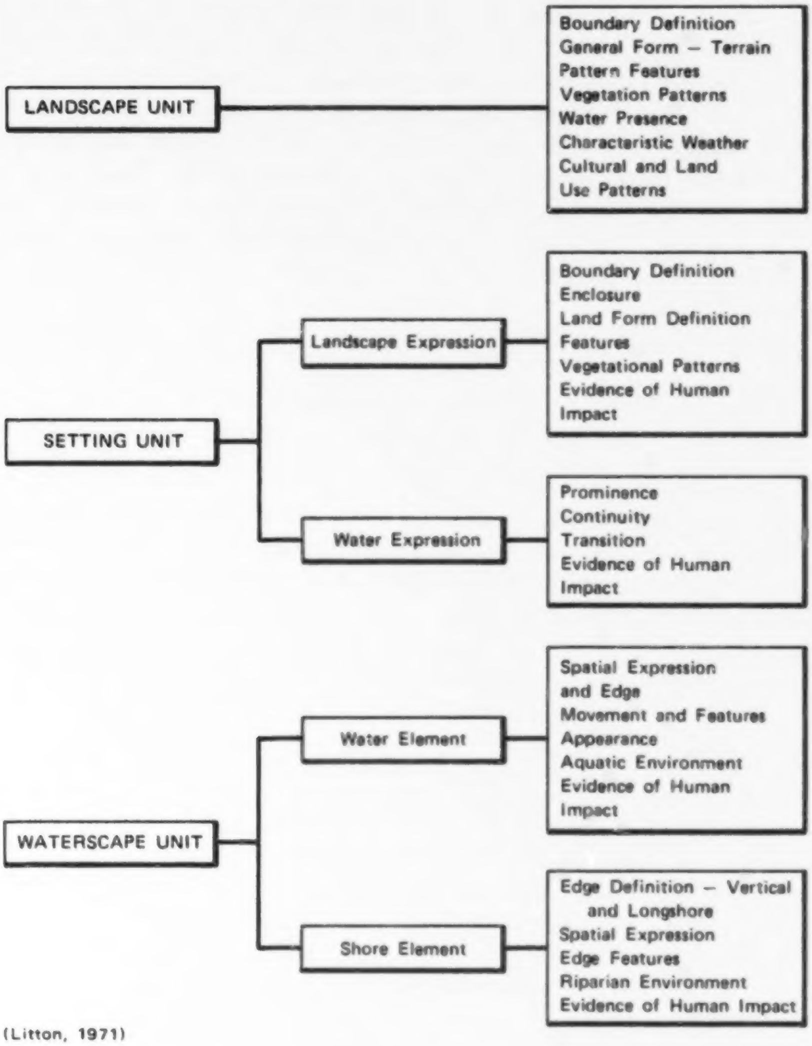
Litton's approach, as described in "An Aesthetic Overview of the Role of Water in the Landscape" is a visual classification system which identifies the aesthetic aspects of water in the landscape derived from the interrelationships of water, vegetation, and landform with human use and man-made change. The aesthetic interaction of man and environment can be assessed as enhancing, compatible, or degrading to the landscape. For this study, the water landscape as "an environmental stimulus and a concrete visual resource" is stressed. Drawings and photographs are used throughout as a visualization of subject matter.

The classification system is built around the following components:

- The landscape unit is a broad interpretation of an area, it suggests a regional or geographic context, characterized by generalized impressions rather than details.
- The setting unit is critical for its tangibility, showing water and landscape in visual combinations--its importance is its reality, establishing the sense for direct appraisal and management situations.
- The waterscape unit carries the detailed sense of water and its immediate shore.

Figure 5 further describes Litton's classification system. The three different units represent various levels of detail for making inventories and evaluation comparisons. Inventories of the water-landscape resource represent the need for documenting in a tangible and graphic way those components and relationships that portray the resource. It serves as an information base and is not by itself evaluative. "Rather, it is factual, carries material which is subject to evaluation and that will appear as supplementary to the general instrument."

Landscape inventories depend on field reconnaissance. Using the basic classification units and their subelements under landscape unit, setting unit, and waterscape unit, selected examples of high and low quality situations are outlined for comparison. Landscaped compositions are then evaluated against the criteria set up by the developers: unity, variety, and vividness. Litton defines these as follows: "Unity is that quality of wholeness in which all parts cohere, not merely as an assembly but as a single harmonious unit. Variety can be defined as an index to how many different objects and relationships are found present in a landscape. Vividness is that quality in a landscape which gives distinction and makes it visually striking."



(Litton, 1971)

FIGURE 5 CLASSIFICATION FRAMEWORK FOR LITTON'S METHOD

The next part of Litton's approach classifies the man-made elements and improvements. These are described in five categories of elements: linear, area, mass, enclosing, and point. Five evaluative terms are then described: unifying (importance to the total scene), focal (conscious direction of attention), enclosing (arrangement of positive enclosure), organizing (formation of coherent patterns, forms, and the like) and modifying/enhancing (positive rapport between structures and landscape). Using these elements and evaluative terms, a quality comparison of structures and alterations is made within the bounds of the three kinds of units.

Analysis: "An Aesthetic Overview of the Role of Water in the Landscape," by R. Burton Litton, is difficult to critique. His approach almost unanimously satisfies the criteria established in this report for analyzing aesthetic measurement methods. At the outset Litton states "this study will not carry an emphasis of behavioral response to the landscape and to water for the very simple reason that there is so little information in this area. We will not make conjectures about what the landscape and associated water mean to the beholder. As references are found in literature and in studies by others which do deal with meaning or response, those findings will be cited." Not only did Litton make continual reference to user preference studies, but he went on to develop three general variables which classify aesthetic experience. These variables represent the basic responses of the observer-user to a particular landscape: "the observer's 'state of mind,' e.g., such as his current perceptual set, past experiences, future expectations, and environmental life style; the context of observation, e.g., boating, photographing, swimming; and the environmental stimulus itself" (Litton, 1971).

The report reviewed does an exceptional job of covering the full range of aesthetic attributes in the visual classification system inventory. The basic framework is structured to show the appropriateness of the factors to the scale being considered (from unit to elements).

Evaluation is made against a well-described high-low measurement index under each element according to prescribed criteria. Example:

High Quality	Low Quality
Overlooks and viewpoints are located to permit view of boundary and extent in a more complete manner than is visible in a moving vehicle.	Few overlooks and viewpoints. Those available are limited to local features or roadside incidents.

Although the method is comprehensive and tends to use designer's language (e.g., "harmony," "patterns," "visual edge," "spatial expression"), it is straightforward and could be reproduced by planning staff, particularly someone with design training.

Results of using this approach should provide the decision maker with information which shows precisely how human use or man-made facilities enhance, are compatible with, or degrade the visual landscape, thus offering a very useful tool for environmental planning. The drawing and photos used to describe the landscape are also excellent communicative resources for obtaining public feedback to proposed projects. Litton also outlines mitigating considerations for activities which degrade the landscape, thus offering options to the decision maker when considering trade-offs among alternative designs.

McHarg's Approach

"A Study of the Potomac River Basin" as it appears in Ian McHarg's Design with Nature, was derived from a study done during the academic year 1965-66, by 18 University of Pennsylvania graduate students of landscape architecture and regional planning. McHarg calls it "a landmark, the first ecological planning study conducted in the United States." McHarg's philosophy of respect for natural systems in planning for human use is central to his methodology for evaluating land use potential. McHarg justifies an ecological approach to land use planning and management in his statement that "it is necessary to understand nature as an interacting process that represents a relative value system, and that can be interpreted as proffering opportunities for human use...but also revealing constraints, and even prohibitions to certain of these [uses]" (McHarg, 1969).

Data on the Potomac River Basin were gathered and assembled in the form of 500 maps and "several pounds of reports." The maps include subject areas such as bedrock geology, soils, wildlife, mineral resources, slope, and unique sites. McHarg divides "unique sites" into "natural phenomena" and "cultural manifestations"; it is in these two areas that aesthetic factors are considered. The map of unique sites keys the following as having what McHarg calls "popular or personal importance:" scenic corridors, significant peaks, sites of geologic interest, sites of vegetational interest, land-based recreational sites, historic structures, historic battle sites, trout streams, water-oriented recreation sites. These maps, then, were used to make maps on the "intrinsic suitabilities" of the river basin for agricultural, forest, recreation, and urban uses. From these maps it became apparent what the "intrinsic dominant land use for each physiographic region" was. However, since part of the objective of the study was to determine

"Multiple compatible land uses," it was necessary to develop a matrix listing "all prospective land uses" on each coordinate. "Each land use was then tested against all others to determine compatibility, incompatibility, and two intervening degrees." In this way, the dominant, or co-dominant, and minor land uses which are compatible for one area are determined. The "prospective land uses" included: urban, suburban residential, industrial, institutional, mining, quarrying, vacation settlement, agriculture, forestry, recreation, water management (subcategories excluded). A second section of the matrix was developed which compares the prospective land uses with "natural determinants," which include: slope, vehicular accessibility, soils, aquifer recharge areas, water supply dependability, climate (subcategories excluded). Thus, for example, an area with poor vehicular accessibility and/or low water supply dependability would be determined to have little or no compatibility with urban or suburban land uses. A third and final section of the matrix compares land uses with their environmental consequences which include:

Air pollution
Water pollution
Stream sedimentation
Flood and drought control
Soil erosion.

"The sum of these [cross impacts], in principle, allows one to consider the intercompatibility of land uses, the natural determinants for their occurrence and the consequences of their operation," all in the context of the ecological character of the different physiographic areas within the river basin.

McHarg makes it clear that this study was not an attempt at a plan: "this study does not suggest that urbanization (for example) should occur on the locations shown. It merely reveals which lands meet the criteria for urbanization that have been selected." That is, potential land-use allocation is actual land-use assignment.

Analysis: "A Study of the Potomac River Basin" successfully establishes an ecological basis for land use planning in the Potomac River Basin. The ecosystems of the area provide the reference point against which alternative land uses and their consequences are measured, fulfilling Criteria 3 and 5 (factors and variables appropriate to scale of system; impacts measured against established reference point). Even with the ecological focus, aesthetic factors are considered. Some mention of the man-made aesthetic features is made, although the emphasis is on the natural aesthetics of the area. The maps and the matrix, using color keyed overlays, are easily understood, even though their basis is technical in nature.

There are two primary disadvantages to this methodology. The first is the time factor of the initial study, which requires an extensive amount of ecological information that is not generally available, to make the maps. The second disadvantage is the centrality of McHarg's values on natural, ecological systems; the study was generated by students who presumably shared his philosophy. To be effective, planning based on this type of study must also be ecologically oriented. (What good would it be to know that an area is unsuitable for urban development if you plan development there anyway?) However, both of these disadvantages will probably become less and less significant in the future as information on ecosystems is continually amassed and public planners begin responding to the increasing public awareness of the importance of the natural environment.

"The Impact of I-84 on Visual Quality"

This nonnumerical visual analysis method is part of a draft Environmental Impact Statement done by Steinitz, Rogers Associates, Incorporated (for DOT) on Interstate Highway 84 in Rhode Island. Like REMAP, discussed under numerical methods, it is based on computer processing and graphic display of data in the form of a grid map of the study area.

Steinitz approaches the visual quality of a proposed highway by analyzing both the view from the highway and the view of the highway from the surrounding area. The entire study area was divided into "cells" to enable data processing. Ten possible highway alignments and a "no-build" option are analyzed. (The "no-build" option is analyzed on the basis of more intense use of existing routes.)

The first step in determining the quality of the view from the highway is analyzing the driver's cone of vision--the area that it is physiologically possible for a driver to see. It also involves a determination of "rear view" and "far view" areas, followed by an analysis done for all "origin points" of view along the road. Next, the visual topography is recorded, or the natural and man-made features which determine "the degree to which places are seen or hidden." The third step is to note all cells within near or far view of each origin point along the route. "Each cell is identified for the frequency with which it is seen, with cells in near view weighted twice." This is repeated for the other direction on the route and the results are printed in a map form.

Next the visual attractiveness of each visible cell is defined as most positive, positive, neutral, negative, or most negative. Principal physical characteristics have been preclassified based on studies by Steinitz and Way (1969) and Rabinowitz and Coughlin (1970); physical characteristics of visible cells are identified, resulting in one of the visual attractiveness ratings listed above for each cell. The fifth step consists of compiling information and printing the results in the form of a grid map. For each cell, a symbol indicates the attractiveness value, weighted by the frequency sighting and the distance from the driver (near or far). The last step, "done external to the computer program...consists of an evaluation of the degree to which the major regional and local features, both land forms and urban development, occur within the view field, thus identifying a sense of place for the road." This is repeated for each alternative route.

The analysis of the view of the highway is done in a similar fashion. First, the "assumed visual characteristics" of the highway are identified. Next, the cells through which the alternative highway passes are identified and "the physical characteristics of that part of the highway" are determined. The third step is to establish the visual topography of the study area (identical to Step 2 of the view from the road analysis). Fourth, the area from which the highway can be seen is established. Each cell is "identified for the frequency with which it is seen, with cells in near views weighted twice." The fifth step is to identify "the predominant land uses within the visual corridor of the highway." This is important because, as Steinitz says, "a highway seen from a prime conservation area (for example), can be considered visually obtrusive, while that same highway seen from an industrial area may not make a great difference to the observer." The last step consists of evaluating the view of the highway from the various cells as a function of distance and setting. "Each setting (e.g., pasture, utility, residence, commerce, etc.) has a near and far weighting factor associated with it which reflects the visual impact of a highway on people within that setting" (Steinitz, 1972). The result of the above process is again a map with symbols indicating the visual impact of the highway on each visible cell.

Analysis: It must be pointed out that "The Impact of I-84 on Visual Quality" is a specific application of a much broader ranging methodology using computer technology for visual impact analysis. This analysis does not cover Steinitz's complete methodology.

General comments concerning the use of computers for environmental analysis have already been made in the analysis of "An Interstate Corridor Selection Process" (REMAP). As pointed out in the previous analysis, the computer is able to record and process enormous bits of information, thus satisfying the criteria for a full range of aesthetic attributes appropriate to the scope of the problem most adequately. Referring to Criterion 4, we find that the primary impacts are very thoroughly studied, yet the secondary impacts are purposely ignored ("the model makes the assumption that those areas which can be seen must be under some system of visual controls, so as to prevent future development from encroaching on what might now be considered a high quality view," Steinitz, 1972).

The methodology was developed with reference to the studies of visual preference for different physical settings done by Steinitz and Way (1969) and Rabinowitz and Coughlin (1970). These studies and the assumptions about the highway impact on various types of land uses are the basis for determining impacts (fulfilling Criterion 5), but these are by no means free of the bias of the developer. Subjective decisions are involved in data collection for determining the characteristics of the various cells which make up the "visual topography." The output maps contain a large amount of information that can be easily read, but, as in the REMAP methodology, do not indicate the hidden biases of the developers. The fact that this study is a part of an environmental impact statement brings up the problem of how to integrate the information into the total impact analysis procedure. The decision maker is presented with fragmented information and must find a way to weigh visual impacts with other environmental concerns.

"Visual Values for Highways"

Hornbeck et al. (1970) wrote a summary report of a portion of the five-year study in highway aesthetics conducted by the Landscape Architecture Research Office at Harvard University (Hornbeck et al., 1970) for the Department of Transportation. One of the primary objectives of the study is to define and assess the qualitative visual criteria for highway design and planning purposes, emphasis being on the "view from the road." As stated in the report 'visual factors of the highway landscape are the major source for information, stimuli, and pleasure for the driver. In order to improve the visual quality of highways, it is necessary to identify those visual components which are useful and significant to the driver and to determine ways in which these factors may be coordinated with procedures for actual highway planning and design" (Hornbeck et al., 1970). During the course of the study, the developers have attempted to identify visual characteristics at both the right-of-way scale and the corridor scale; to identify relative driver perception values; to relate qualitative values (aesthetics) to quantitative values (cost) to aid decision making; and to provide a direct relationship to study procedures in the existing highway planning process. The analytical techniques used in the study are also adaptable to computer manipulation and simulation. The methodology, data, and procedures for the determination of visual values of merit were tested and illustrated by case study, using an existing highway (Route 109 in eastern Massachusetts). The report's major concern is that "consideration of highway aesthetics should involve all visual factors and all relationships which influence the linkage of driver seeing and reacting. These factors and relationships imply input to driver experience and behavior. They are the visual impact of the progression and organization of landscape views, changes in road alignment, enclosure by vegetation or buildings, and landmarks. The visual highway environment is the source of significant driver information, guidance and pleasure" (Hornbeck et al., 1970).

Major visual factors would be those characterizing the general landscape composition at corridor scale--e,g., mountains, valleys, rivers. These are important for driver orientation. Other driver needs related to the corridor scale are listed under the category of environmental awareness. These are "sensing the natural and man-made communities" and "sensing environmental composition." At the right-of-way scale, visual factors such as sequences of views, topographic elevation, and enclosure by vegetation or cut slopes are important for the driver's task performance--e.g., path finding or speed control, sense of place, sense of identity, sense of well-being (Figure 6).

The procedure starts with corridor selection: relative visual values for driver use are first established by comparing many visual factors at corridor scale. Then, within the corridor selected, relative values are further identified for route location values of optional or highest merit. The route having been selected, values of aesthetic merit are then identified and compared for optimal R.O.W. (right of way) design development. Rated inventory data are entered into the computer cell by cell, and a map inventory of rated factors is recorded for programmed grid printouts. The case study utilized a grid to map the inventory. The grid size selected was one kilometer square, applied over a U.S. Geological Survey map at a scale of 1 in = 2,000 ft. Ratings are adjusted to give a total rating in each cell that represents its optical characteristic. Comparative analysis of preferred routes can then be made based on selected criteria (optional location of route based on ecological criteria compared to optional location of route based on visual criteria).

Analysis: "Visual Values for Highways" deals with the very specific problem of assessing visual quality as it relates to highway users; the range of application is limited. Analyzed against the evaluation criteria, Hornbeck's method demonstrates the strongest points under Criteria 2 and 3 (full range of aesthetic factors and appropriate to intended scale). Factors are determined at both corridor and right-of-way scale which are directly relevant to highway planning. Man-made, natural and unique aesthetic attributes are considered within the range of factors.

The primary problem, states Hornbeck, is that "the way in which aesthetic values can be and are significant and useful for the driving experience has received little attention." He goes on to recommend "in-depth identification of driver behavior needs, at R.O.W. scale, to provide detailed criteria for applied design with visual factors of aesthetic value." This indicates that the visual needs of the drivers--the basic foundation for the approach--are not yet well defined. The lack of appropriate references to support the driver performance needs (e.g., especially emotional factors), and how to adequately assess the type of visual landscape necessary to meet these needs, is the major weakness in the report. The organization

DRIVER TASKS AND ACTIVITIES	RELATION TO SCALE		
	CORRIDOR	ROUTE	RIGHT OF WAY
TASK I: VEHICLE CONTROL			
Activity A: Steering and Speed Control			●
Activity B: Maneuvering			●
TASK II: NAVIGATION			
Activity A: Path Finding			●
Activity B: Orientation		●	
TASK III: ENVIRONMENTAL AWARENESS			
Activity A: Sensing the Natural and Man-Made Communities	●	●	
Activity B: Sensing Environmental Composition	●		
TASK IV: EMOTIONAL FACTORS			
Activity A: Sense of Well-Being		●	●
Activity B: Sense of Place		●	●
Activity C: Sense of Territory			●
Activity D: Sense of Identity			●
TASK V: AESTHETIC EXPERIENCE			
Activity A: Specific Elements and Settings	●	●	
Activity B: Qualitative Composition		●	

(Hornbeck, 1970)

FIGURE 6 DRIVER TASKS AND DRIVER ACTIVITIES RELATED TO SCALE OF SEEN SURROUNDINGS

of the report itself hardly meets its objective of providing a "systematic, procedured approach that can be used by others and communicated easily." Material is repeated throughout with the result of losing the "clearly defined methodology" somewhere in the pages. A precise definition of each of the criteria never does appear. (This may be due to the fact that the report reviewed is a summary.) According to the operations process, cells are rated by the percentage of elements within the grid area and the way the inventoried data satisfy the driver needs. The description of the way these rates are determined is very sketchy--for instance it is stated that an abundance of visual stimuli within a grid cell could be stressful, but there is no indication of how "boring" and "stressful" limits are established.

One final comment, narrowing the scope of visual concern to the view from the road does not meet the requirement of the NEPA, and may, in fact, select a highway corridor causing the greatest visual impact when the highway is assessed from the surrounding community (view of the road). The grid map illustrating a combination of different environmental factors for selecting the preferred route provides the most useful information for the decision maker.

Zube Ranking Systems

The ranking systems for the North Atlantic Regional Water Resources Study (Appendix N, "Visual and Cultural Environment") was designed by Erwin Zube et al. (1970), Research Planning and Design Associates, Incorporated.

The objectives for this study were to identify the quantity and quality of visual and cultural environmental or resource values in a locational or geographic context, to assess the needs within the region for quality visual and cultural resources, and to relate the needs and the available resources to the planning objectives and the planning time period set for the study.

In the study, permanent and changeable landscapes were evaluated separately for the 167,000-square-mile region. The permanent landscape was classified into five landscape series ranging from mountains to flatlands. Changeable landscapes were classified into eight units, determined by intensity of use, ranging from center-city unit to forest wildland landscape unit.

The approach included four basic steps:

(1) A landscape inventory using visual indicators of both natural components of the landscape, such as hills or mountains, and man-made components, such as towns and farms.

(2) Identification of visual and cultural qualities in the landscape (natural and man-made components). Visual qualities are related to the image or perceived landscapes, the degree to which visual satisfaction and stimulation is maximized, and to scarce or unique landscape resources. Cultural qualities are related to opportunities for man's use (recreation, sightseeing) and to the relationship of the landscape to lifestyle and amenities as well as to cultural artifacts (monuments, historic objects) in the landscape.

These qualities are ranked high, medium, and low to the extent possible (primarily subjective).

(3) The third step is the definition of needs and the assessment of a general order of magnitude for visual and cultural needs. The needs are only related to water and related land resources.

The permanent and changeable landscapes are evaluated separately. "Permanent" refers to characteristics such as mountains, rolling hills and coastline, a series of six basic landscape types, and "changeable" refers to cityscape, farms, forest, and so on.

(4) Step four addresses "devices" which can be employed to bridge the gap between needs and resources and planning objectives and planning time period. Devices range from flood walls and reservoirs to those dealing with cost and effectiveness. Finally, devices are considered in terms of setting of priorities for the planning time period.

Each landscape series is then evaluated for the quality of contrast, spatial sequence, and water variables, and ranked high, medial or low according to the relative abundance or scarcity of a given landscape. Criteria were also established for a qualitative evaluation of subseries and units of the five landscape series. Units represent the changeable landscape, e.g., center city, farm, forest. Rankings of high, medium or low were assigned to units also; these were subjective evaluations based on the extent of visual contrast and the diversity of spatial configuration created by the landform. The greater the degree of contrast and the greater the variety in the spatial configuration, the higher the value. "Variety in landscape pattern is a product of the scale and distribution of open land-crop fields and pastures, closed land (forest and woodlots), water surface (lakes), and buildings. The distribution of these elements on the land determines the richness or the monotony of the pattern."

The method is basically nonnumerical but the author indicates that number values could be assigned (e.g., 3-6-9) to the respective low-medium-high rating and numerical weights could be assigned to evaluations.

Weighted values would be based on the hypothesis that "The more dominant the form (series) the less important the pattern (unit) for high visual value." The example cited was "pattern is not important for high value in mountains but it is very important in flat land. In the case of the latter, the pattern is the major variety or diversity generating element."

The second part of the approach is the assessment of visual and cultural needs. These are primarily expressed in time and distance measurements from a population being served by a particular landscape use. The author speaks of needs in a general sense as they "relate to the requirement for quality, opportunity, and diversity in life style and environment." He goes on to outline these needs as follows:

(1) The need for the preservation of unique natural and cultural landscapes.

(2) The need for a quality visual landscape, natural and man-made.

(3) The need for landscape diversity, and protection of this diversity where it is integral to the value of composite landscapes.

(4) The need for improved water quality in and around major population centers.

(5) The need for improved and increased urban amenities (particularly as related to water use).

Which landscapes fulfill each need is determined from a number of sources. Much of the information comes from materials that have already been gathered for other purposes. Unique landscapes are identified through state published inventories of natural features, travel guides, natural history books, and, primarily, National Park Service publications. Visual quality is indicated by the recreational demand for the landscape and relative freedom from misfits. Landscape diversity is determined by the variation of landscape units in the area. Finally, the availability of urban amenities is determined by the area's water-oriented resources.

The possible consequences of individual water resource management activities are outlined and illustrated in terms of visual, cultural, and ecological impacts. In this manner, the study provides a fairly complete background for considering specific projects.

Analysis: The "North Atlantic Regional Water Resources Study," Appendix N, by Zube et al. establishes a firm basis for assessing the quality of visual impacts in the field of water management. The evaluations of aesthetics come from both user surveys and professional inventories, providing a balance for the developers' biases.

A fairly full range of aesthetic attributes are considered under man's needs in relationship to the environment. The importance of unique landscapes of both man-made and natural features and the effect of misfits are all recognized in this system. These are applied broadly, mainly in terms of dominant features in a landscape. This method is considered quite appropriate for regional planning purposes.

Some awareness of secondary as well as primary aesthetic impacts is shown in the study. The visual and cultural needs defined include consideration of the effects of development on livability (in urban areas) and usability (in recreational areas) around a site, thus indicating areas particularly sensitive to development either directly caused or induced by project activity.

The methodology can be applied and results communicated easily. The verbal and pictorial illustrations of impacts of different project types give the planner a place to begin considering aesthetic impacts, and a format for presenting the information once the impact has been assessed. While in this study the impact assessment methodology is used for limited range of projects (i.e., water resources) the overall pattern could be easily adapted to other types of development, on a regional scale.

The portion of the study reviewed for this report is limited to the Appendix for Visual and Cultural Environment, therefore an evaluation of how aesthetic characteristics were interrelated with other factors is not made here.

Summary of Nonnumerical Visual Analysis Methods

The above methods represent both comprehensive and independent visual analysis methods. Their similarity is evidenced in the fact that they do not attempt to assign numerical values to aesthetic impacts. Table 3 summarizes the review of these methods.

Category 2 Review--User Analysis Methods

Criteria for Analysis

The methods analyzed in this section were designed to assess user preference to aesthetic (visual) stimuli; therefore, an appropriate set of criteria was

Table 3

NONNUMERICAL VISUAL ANALYSIS METHODS

Criteria	Litton (aesthetics)	McHarg (comprehensive)	Steinitz (comprehensive)	Hornbeck (aesthetics)	Zube (aesthetics)
(1) Generated from public experience not developers biases	(+) Refers to Craiks and others work	(-) Students to inventory	(+) Referred to user preference studies	(-) Claim none available	(+) User preference studies conducted concurrently
(2) Full range of aesthetic attributes	(++) Very comprehensive	(+) Emphasized natural elements	(+) Extensive data	(+) Slightly sketchy	(+) Adquately described
(3) Factors and variable appropriate to purpose of system	(++) Full scale covered in unit classification	(++) Based on natural eco-system, variable	(++) Corridor and R.O.W. scale	(+) Corridor and R.O.W.	(+) Regionally applicable not overly detailed
(4) Primary aesthetic and secondary aesthetic impacts considered	(+) Primary only but includes mitigating	(+) Shows incompatible	(-) Primary only	(-) Primary only	(-) Defined visual and cultural needs and uses
(5) Impacts measured against established reference points	(++) High-low description thorough	(+) Eco-system compatibility	(+) Visual attractiveness	(-) Not clear how limits are set	(+) Weighted against user needs
(6) Straightforward and easily reproduced	(+) Design oriented but well described	(-) Extensive data collection	(-) Extensive data computerized	(-) Poorly organized and described	(+) Easily obtainable data
(7) Output easily communicated	(++) Human use enhances compatible	(+) Map overlay communicative	(-) Hidden values, difficult to interpret	(-) Weighting confusing	(+) Well described

Note: (-) indicates that the system does not satisfy corresponding criteria
(+) indicates that the system satisfies criteria adequately

developed for evaluating the usefulness (or "workability") of the systems with an attempt to parallel the criteria used for evaluation in Category 1. The following criteria apply:

(1) The system should be designed to include as wide a range of cross sections or cultural groups (age, nationality, economic class, education) as possible and should specifically aim to ensure that the biases of the developer are minimized in structuring the system.

(2) The system should cover the full range of aesthetic attributes in the environment including: natural and man-made (built) characteristics, unique features, and misfits.

(3) The system should be theoretically sound (Boster, 1973). The testing techniques should be well grounded in accepted measurement theory. A technique should be valid in that it measures what it claims to measure, and reliable in that it yields consistently repeatable results. Experimental conditions should be well documented.

(4) A good technique will be straightforward and easily reproduced by others. It should also be relatively inexpensive to employ. Persons having similar skills and training and those who develop a technique should be able to reproduce and evaluate it (Fabos, 1971). Similarly, the complexity of the technique and sophistication of the tools used in the system should reflect the resources typically available to the intended users (including manpower, budget, and hardware).

(5) Finally, the information generated by applying the techniques should be easily translated by planners and decision makers when using it for communication and decision making.

Review of User Analysis Methods

Landscape Preference Model

The landscape preference model developed by Elwood L. Shafer, Jr., and James Mietz for the U.S. Forest Service is presented in a 1970 paper entitled "It Seems Possible to Quantify Scenic Beauty in Photographs." The paper describes the development and application of the model in New York State and in Utah to show that recreationists in both geographic locations prefer the same kind of forest landscapes when the landscapes are depicted by 8x10-inch black and white photographs (Shafer and Mietz, 1970). The objective of the model is to provide a quantitative index to the ways in which one landscape is generally preferred over another, as an aid to planners and resource managers when evaluating the aesthetic quality of different landscapes.

The basic approach defines eight different zones within a landscape photograph (e.g., Zone A--sky and clouds, Zone B--immediate trees and shrubs, through Zone G--distant features, and Zone J--water). The model uses measurements in six of the eight zones (variables) to predict a landscape preference score, Y, for each of the photos rated. The following model was developed by rating 100 landscape photos:

$$Y = 184.8 - .5436 X_1 - .09298 X_2 + .002069 (X_1 \cdot X_3)$$

$$+ .0005538 (X_1 \cdot X_4) - .002596 (X_3 \cdot X_5) + .001634 (X_2 \cdot X_6)$$

$$- .008441 (X_1 \cdot X_6) - .0004131 (X_4 \cdot X_5)$$

$$+ .0006666 X_1^2 + .0001327 X_5^2$$

where:

X_1 = perimeter of the immediate tree-and-shrub zone.

X_2 = perimeter of intermediate other-features zone.

X_3 = perimeter of distant tree-and-shrub zone.

X_4 = area of intermediate tree-and-shrub zone.

X_5 = area of water zone.

X_6 = area of distant other-features zone.

The lower the Y value, the more preferred the landscape.

(Shafer, 1970)

Values for the independent variables were obtained by placing a 1/4-inch grid over the photograph and tracing a landscape-zone area or perimeter measurement by using the edges of the squares as boundary lines. All six zones will not necessarily occur in every photograph. A perimeter measurement for the first three variables is the total number of grid edges along the boundary of that particular zone. Zones occurring in different locations in the same photo are added by perimeter measurement. The area measurement for variables 4, 5, and 6 is the sum of squares within a given zone.

The model was then tested on 50 day-users in the recreation area in Utah. Interviews were restricted to local residents of the area who were 12 years of age or older. For the test, 14 of the original 8x10-inch photos were selected randomly and sorted into two sets (A and B) of seven each. Each person interviewed was asked to rank the seven landscapes in each set from 1 to 7 with the most preferred photo ranked first.

Using the ranked value of each of the photos by 50 respondents, the sum of the 50 values was a photo's total preference score, Y^1. The highest score any one photo could receive was therefore 350. In actuality, scores ranged from 128 to 265(A) and 138 to 278(B).

Next, the perimeter and area values for each of the 14 photos were computed using the predicted preference model. Predicted scores for the photos ranged from 71 to 174(A) and 99 to 212(B). When predicted and observed scores were compared, there was "agreement far beyond what might be produced by sampling variance." Thus the use of ranked values rather than numerical scores was justified on the basis that the procedure helped eliminate biased scores.

Limitations of using photos for landscape evaluation were admitted. For example, the differences between the predicted and the observed scores for some photographs are attributed to the fact that the photos did not adequately stratify macro and micro landscapes in the environment (such as the type and proportion of water in the landscape). It is suggested that "by knowing what quantitative features in the photos of a landscape affect its aesthetic appeal, resource managers and planners can begin to have a factual basis, in addition to an intuitive one, for decisions about wildland aesthetics."

Analysis: The Landscape Preference Model, described in "It Seems Possible to Quantify Scenic Beauty in Photographs" (Shafer and Mietz, 1970), is theoretically sound, straightforward, and easily translated by planners. However, an explanation of how the prediction model coefficients were arrived at would be of value. Since the specific applications and testing conditions are well described, a potential user is aware of the limited application of the model. The method tests photos of natural landscapes only, and primarily wilderness scenes. However, a similar model could presumably be developed for measuring urban scenes. Verification of the preference model was limited to local people who were already familiar with the area being rated, which does not give a very representative cross-section of user preferences.

Judging from the photos presented in the paper, which all have spectacular natural features of one form or another (waterfalls, mountain range, dense forest), it would seem difficult to make a generalization about the preferences expressed by such a limited sampling of observers. It does, however, provide ample information concerning those characteristics in a wildland landscape which are preferred, e.g., water, trees, hills.

Measuring Response to Road Design Features

Dr. Gary H. Winkel of the Environmental Psychology Program at City University of New York presents a user analysis method for road design in a 1970 paper entitled "Community Response to the Design Features of Roads--A Technique for Measurement."

This paper describes a method developed to determine user attitudes toward the design quality of selected visual portions along urban arterials. The technique utilizes a series of black and white slides showing sections of roadside along a highway in Seattle, Washington. Selected segments represented typical "commercial" and "landscape" types of roadside development, ranging from utility poles and overhead wires to billboards, trees, and open space. "These two aspects of the roadside were selected as test displays because they exhibited variable backgrounds and a common overlay of the kinds of physical objects typically placed along urban roadsides" (Winkel, 1970). By using a photo retouching technique on slides of the roadside it was possible to experimentally simulate the "removal" of selected objects (e.g., telephone poles) while leaving the remainder of the "environment" intact. The 80 observers were asked to rate the photos of the existing environment on a set of 64 semantic differential adjectives and rate the photos again after they had been modified. Thus, it was possible to detect changes in observer evaluation which might occur as the environment is modified. Observers were also tested for patterns of eye movement with a Polymetric Model V-1164 eye-mounted camera used to determine how patterns of eye movement shifted as a function of removal of various roadside objects. Additionally, a 95-item questionnaire was constructed to assess attitudes on a variety of urban problems to place the issue of roadside aesthetics in some context. For this stage a set of 13 typical urban problems (e.g., litter, junkyards, dilapidated buildings) were presented for observers to assign priorities for solution.

The observer group of 80 consisted of 40 females and 40 males further divided by educational level and income. They were generally representative of a middle- to upper-class income group and had completed 12 to 15 years of education.

Several surprising results came out of the testing. One surprise, which was a consistent finding for both routes presented, was that the objects least noticed upon removal were billboards. Instead, it was the absence of utility poles and overhead wires that was detected. "The findings of the present research point to the importance of being able to secure a degree of experimental control over the elements which comprise a complicated visual environment. The data clearly indicates that observer response to selective changes in the roadside environment is neither random nor unpredictable" (Winkel, 1970).

Analysis: In his article "Community Response to the Design Features of Roads--A Technique for Measurement," Winkel presents useful information to the decision maker (e.g., billboards are less noticed than utility poles, and commercial arterials are uninteresting). However, although the method is well documented and is exceptionally well designed for controlled experimental testing, it tends to be quite technical and should be administered by trained social psychologists. The testing procedure itself is a complex three-phase method using some specifically designed equipment (eye-mount camera), analytical tools (64 x 64 matrix of correlated coefficients), and also requires a skilled staff for both operational and interpretative tasks.

However, even though the method is not readily adaptable to local testing situations by planning offices, it does provide very useful information to the planner and decision maker. In such cases, the professional psychologist must be relied on to conduct the testing, but with the objective of providing useful reliable data to the information users.

"Scenic Resources: A Study of Scenic Preferences"

A professional paper prepared by Charles L. Jackson, graduate student at Colorado State University, entitled "Scenic Resources: A Study of Scenic Preferences" (1972) describes a third user analysis methodology. Jackson's paper addresses the problem of analyzing how the variables and factors (or descriptors) which make up a scene contribute to user preferences. The objectives for the study were: "(1) to isolate those descriptors which cause a scene to be attractive or unattractive; (2) to measure the user preferences for a particular zone (after Litton, 1968) of a scene; and (3) to determine if preference or non-preference for zones within a scene is equal to the preference or non-preference for the scene without consideration of any of its particular zones" (Jackson, 1972).

The method utilized 35mm color slides of scenery from three different types of landscapes to test preferences. One hundred individuals from five different local groups were asked to express their preferences for selected factors by numerical ratings and written descriptions on questionnaires which were keypunched and tabulated on a prepared computer program, Statistical Package for Social Sciences (Nie et al., 1971). The methodology was first pretested on a group of 87 students at Colorado State University, and refined accordingly. Socio-demographic and other characteristics of individuals were collected but not analyzed in this study.

Three types of landscapes were depicted in the slides: a glaciated high mountain valley, a river bottom valley, and a plains-foothills transition zone. Slides were selected on the basis of whether or not they contained three distance zones, and whether or not they were representative of the area inventoried. R. Burton Litton's landscape inventory system was used as a guide to record observer's position, distance, and scene composition.

> "To isolate those descriptors which cause a scene to be attractive or unattractive, color 35mm slides of scenes were projected one at a time onto a 3x4-foot sheet of white paper on which the distance zones had been delineated. This was done for each of the nine landscape slides. Observers were asked to indicate attractive or unattractive aspects of each zone by writing one- or two-word descriptions in appropriate spaces on the questionnaire. The descriptions were then analyzed and listed according to frequency of use and correlation with slide preferences. Both attractive-unattractive differences and ratios were then calculated" (Jackson, 1972).

Respondents were also asked to indicate their zone preference within each slide on a first, second, third rating. These preferences could then be compared with zone rankings to indicate where the attention and interest of the observer was directed.

Finally, a paired comparison of all nine slides shown in all possible combinations was made. Respondents were asked to rate them from most to least preferred. Preference was determined by totaling the number of times either slide of a pair was chosen. The Spearman Rank Correlation Coefficient was applied to measure the degree of agreement between the two user preference ranks.

Analysis: Jackson's methodology, in "Scenic Resources: A Study of Scenic Preferences," directly addresses the problem of determining what it is in a landscape photo that makes it attractive or unattractive to the observer. Although his respondents were mostly educated, middle-income level individuals, and although the photos that were evaluated were scenes of natural landscapes only, the study provides information useful to the resource planner. The method is well described in the paper and could be adapted at local planning offices for a wider range of applications provided the offices were equipped with the appropriate computer facilities and photographic equipment.

Modeling Human Response to the Visual Environment

George C. Peterson and Edward S. Neumann, in a 1969 paper entitled "Modeling and Predicting Human Response to the Visual Recreation Environment," present a method to "measure and analyze human preferences for the visual recreation environment" (Peterson and Neumann, 1969). The approach is actually twofold, first to model the individual preference process, and second to model interpersonal differences. Thus, "while the model of the individual preference process defines a system consisting of measureable components, the model of interpersonal differences includes the richness of human variation."

To obtain data for the model, recreation environments were simulated by photos and responses were classified by techniques of psychological measurement. A variety of beaches along Lake Michigan in the Chicago metropolitan area were simulated in a set of 14 8x10-inch black and white photographs to obtain response from over 200 beach users to determine which visual characteristics of beaches most influence a user's satisfactions, and to see the variety of preferences among users. Data acquisition proceeded in two stages, beginning with free responses to the question: "What do you like or dislike about the beach?" These descriptions were used to identify variables. Respondents were then asked to rate preferences for each beach on a scale of 1 to 100, the higher number representing positive preference. (The technique used is referred to as measurement by semantic differentials.) Next, people were grouped by preferences using methods of numerical taxonomy. Peterson found that variations in preference appeared to form a continuum, with individuals at one end expressing very high preference for most photos of city beaches and very low preference for most photos of scenic natural beaches. At the other end of the continuum, the opposite preferences were expressed. These results supported the hypothesis stated in the study as follows:

(1) The visual environment can be described as a vector of fundamental visual characteristics to which people respond. Because the characteristics can be measured, it is possible to describe the appearance of an environment in terms of the quantity of specific characteristics. In the model the characteristics are derived so that they are perceived independently--that is, a change in the perceived amount of one characteristic does not change the perceived amount of the other characteristics.

(2) Preferences vary from person to person.

(3) Individuals can be aggregated into groups so that differences in preferences and perceptions are significantly greater between groups than within groups.

(4) Differences in preferences and perceptions between groups can be explained by differences in socioeconomic, cultural, personality, experiential, or other characteristics of members of the groups.

(5) Given the relevant characteristics of the individual, his preferences are determined or influenced strongly by the perceived characteristics of the environment.

(Peterson and Neumann, 1969)

Analysis: The Peterson-Neumann paper, "Modeling and Predicting Human Response to the Visual Recreation Environment," was written, in part, for a technical audience. The development of the model is described in considerable detail, showing mathematical equations and schematics of the preference process. The methodology is well documented, describing experimental conditions and statistical tools used in its application.

By far the most promising feature of this method is that it deliberately considers differences in preferences and perceptions between groups, and attempts to correlate these differences with socioeconomic, cultural, and personality characteristics of members of the groups.

We agree with the author's conclusion that "this kind of research seems to be a move in the right direction. Surely, if recreation facilities and environments can be analyzed in terms of those more fundamental attributes to which people are sensitive, it will provide greater flexibility and efficiency in the provision of opportunities" (Petersen and Neumann, 1969).

Measuring Viewpoints of Urban Residents

The user analysis methods reviewed to this point have been systematic techniques utilizing photographs to elicit preference ratings by selected observers. "Environmental Quality of City Streets: The Residents' Viewpoint" by Donald Appleyard and Mark Lintell, presents another approach to user analysis, one which relies on open response interviews and on-site observation. Appleyard's concern for assessing the quality of the urban environment from the user's viewpoint is the thesis of many other studies by Appleyard, alone or with others. These include: "The View from the Road, by Appleyard, Lynch and Myer (1963); "Styles and Methods of Structuring a

City," by Appleyard; "High Rise Buildings in San Francisco--The Political Conflict and Some Methods of Assessment," by Donald Appleyard and Lois Fishman (1973).

In the above article a method for identifying the environmental concerns (including aesthetic) of those who live on city streets was applied in a pilot study in San Francisco. Residents living within a one-block area on three different streets were interviewed. Criteria for selection of three distinctly different streets was based on traffic levels. These were categorized Heavy street, Moderate street, and Light street. The street blocks selected for the study were of similar residential character (physical appearance) and contained a residential population relatively homogeneous in social class and income level (primarily residual Italian neighborhoods with some other native-born white and some Orientals). Primarily, residents differed in family composition, ownership, and length of residence.

The initial part of the study approach was a detailed interview (lasting about one hour) taken with 12 residents (of three different age groups) on each block. Persons interviewed were considered representative of about 30% of the block's residents, providing a small but relatively reliable sample. The initial interviews were supported by systematic observations by trained staff and some objective measurements of pedestrian and traffic activity on the streets.

Five major categories of criteria were used to assess environmental quality on each of the three blocks. These were used to "describe the character and day-to-day use of the street as well as the concerns and satisfactions of the residents."

The criteria categories were as follows:

(1) Traffic hazard--concerns for safety associated with traffic activity;

(2) Stress, noise, and pollution--from noise, vibration, fumes, dust, and feelings of anxiety concerning traffic;

(3) Privacy and home territory--the residents' responses to intrusion from outside their homes, and the sense that part of street itself was an extension of their personal territory or turf;

(4) Neighboring and visiting--the degree to which residents had friends and acquaintances on the block, and the degree to which the street was a community; and

> (5) Identity and interest--the degree to which the respondents of the 3 age groups were aware of their surroundings and the strength of each street's identity and were concerned for the external appearance of the buildings and the street as well as the degree to which the residents of the street felt that they were able to make adjustments and alterations to the street environment through planting, construction, and other means.
>
> (Appleyard, 1971)

Questions in the interview were related to one or more of the criteria. Answers were rated by the interviewers on a 5-point scale of environmental quality. Individual ratings were then aggregated by street for each question. Responses were not weighted for overall importance, and ratings were considered "rather abstract interpretations of the way people feel." The report presented selected responses in the form of short quotes in cartoon form of the blocks analyzed. In terms of visual quality, maintenance and clean appearance were two concerns expressed by inhabitants of all three streets. The difference was that on Heavy street the landlords were held responsible for maintenance. "Because the street did not encourage people to be outgoing, tenants were reluctant to accept responsibility for the street itself, so they avoided picking up trash and were slow to defend the street against vandalism and abuse" (Appleyard, 1971). Maintenance on Light street was, however, considered a local matter. As one resident put it, "The quality of the street is getting better in that people take great care of their properties (some even planted trees), but worse in that there is more traffic and more cars on the street" (Appleyard, 1971).

The study conclusions showed a high correlation between amount of street traffic and perceived environmental quality as expressed by residents. These were additionally correlated with residents' age and income and degree of transience, showing a difference in attitudes between those who considered the neighborhood a temporary living environment and those who were faced with it as a permanent residence.

Appleyard goes on to discuss some policy implications in terms of proposals and standards based on the study results. He states "The ultimate policy aim of research in this field should be to set environmental standards of livability for residential streets, established by a set of criteria that might be termed Environmental Rights for those who live on residential streets."

Analysis: In "Environmental Quality of City Streets: The Residents' Viewpoint," Appleyard sets forth a method representing empirical research based on survey and observation techniques. Because the pilot study used a select, limited number of residents to interview, the data and conclusions are somewhat limited in the generalized statements about residential attitudes that can be supported. The implications of the responses, however, do indicate specific areas of concern for the quality of the urban environment. The method is broad enough in scope to cover the primary criteria categories and yet, the study design is not complicated and could therefore be adapted to many local planning situations. The graphic drawings (cartoons) describing types of response to the interview questions provide very useful tools for communicating the study results to decision makers and the public.

Summary of User Analysis Methods

The methods reviewed for user analysis are merely representative of the total state of the art. Others belonging in this category, but not reviewed in the text of the report, are included in the list of references under "Additional Methodologies." Table 4 summarizes the methods reviewed here.

Summary of Methods

General Summary for Visual Analysis Methods

The methods reviewed are a select few of the total state of the art available. However, they do serve as representative models of the different techniques developed to date. Several useful first approximations can be drawn by reviewing the summary tables for both the Comprehensive Environmental Analysis Methods and the Independent Aesthetic Assessment Methods (Tables 1, 2, and 3).

Evaluated with the criteria stated at the beginning of this section (page 42) the Visual Analysis Methods can be summarized as follows:

- Criterion 1--The system should be generated from public experience and as free as possible of the developer's biases.

  Eight of the eleven methods reviewed demonstrated obvious biases of the developers in both the selection of the variables to consider and in the valuation of impacts. Litton's (1971) method was the only one that validated his approach by stating cognizance of Craik and others' work in user preference studies.

- Criterion 2--The system should cover the full range of aesthetic attributes in the environment. All of the methods reviewed satisfied this criterion to varying degrees. The Bureau of Outdoor Recreation Study (Handley, 1973) was by

Table 4

SUMMARY-USER ANALYSIS METHODS

Criteria	Shaefer	Winkel	Jackson	Peterson	Appleyard
(1) Wide range of social cultural groups	(-) Local area recreationists only	(-) Educated middle income only	(-) Students and citizen action groups	(+) Deliberate consideration of diverse groups made--large sampling	(-) Small sampling
(2) Full range of aesthetic attributes	(-) Positive natural features only	(-) Man-made primarily	(-) Natural features primarily	(+) Variables defined freely	(+) Wide range
(3) Theoretically sound experimental condition documented	(+) Limitation and condition well explained	(+) Controlled testing well documented	(+) Pretested for inconsistencies	(+) Available measurement and statistical tools	(-) Loosely conducted
(4) Indicates reasons for preferences	(+) Model indicates reasons	(+) Attitude questionnaire	(+) Description and preferred zones	(+) Variable selection does this	(+) Questionnaire
(5) Straightforward and easily reproduced	(+) Coefficients need some explanation	(-) Complex, professional	(+) Well explained, some computer	(-) Professionally dependent	(+) Very adaptable
(6) Information easily communicated to planner and decision maker	(+) Limited in application	(+) Resulting information relevant	(+) Scope of problem somewhat limited	(+) Not only tells 'what' but also 'why'	(+) Cartoons (-) limited survey

Note: (-) indicates that the system does not satisfy corresponding criteria.
(+) indicates that the system satisfies criteria adequately.

far the most comprehensive system for identifying aesthetic attributes. The Battelle methodology (Dee, 1972) begins to demonstrate the relationship of aesthetics to other environmental factors, showing how aesthetics is an integral part of a number of environmental considerations but they failed to interrelate these factors in impact evaluation. We feel that the interaction or network aspect of environmental analysis and assessment methodologies is of utmost importance.

- Criterion 3--The aesthetic factors and variables used should be appropriate to the scale and purpose of the ranking system.

  All methods reviewed satisfied this criterion. Most of the methods clearly stated the intended scope of concern for analysis and adequately described significant aesthetic factors to consider.

- Criterion 4--Secondary as well as primary aesthetic impacts should be considered.

  Only McHarg (1969) and the Bureau of Outdoor Recreation (Handley, 1973) showed vague concern for delineating areas sensitive to impacts that may result from activities induced by project development. Since many secondary aesthetic impacts can be considerably more detrimental to a community than primary impacts, this is a major weakness in research in applied technology.

- Criterion 5--Impacts should be measured against an established reference point.

  A little over half (6 out of 11) of the methods satisfied Criterion 5. Litton's method (1971) and Handley's (1973) rate high in this area because they clearly described the conditions for assigning a high or low ranking to each aesthetic characteristic considered.

- Criterion 6--A good technique will be straightforward and reproducible.

  Leopold's methods (Leopold, 1969; Leopold, 1971) were rated exceptional in this area because they were considered adaptable to most local planning offices. They utilized available resources (technical expertise, reasonable man-hours for data collection and limited hardware-computers) thus are considered economically feasible.

- Criterion 7--The output of the system should be easily translated and provide useful information to the planner and decision maker.

The fact that a number of the methods were value-laden resulted in only 5 out of 11 methods being considered useful to the decision maker. This is a basic criticism of available methodology and one that must be given appropriate weight for continued research.

General Summary of User Analysis Methods

Methodologies reviewed in this section represent only a beginning in a continuing trend toward attempts to assess personal preferences and community values concerning aesthetic characteristics of the environment. An interesting observation made from reviewing the two categories of methodologies was the repeated recognition of the need for establishing user preference data to validate aesthetic assessment techniques. Yet, very few of the visual analysis methods made any reference to obtaining feedback in this respect. If environmental impact analysis is based on an interactive social policy, individual attitudes and community values must be an integral part of any method for environmental assessment.

Reviewed against the appropriate criteria the user analysis methods can be summarized from Table 4 as follows:

- Criterion 1--The system should include a wide range of cultural, social and economic groups.

  Only one of the methods reviewed (Peterson, 1969) satisfied this requirement. Most methods selected a small sampling of the possible 'users' of a particular environment. The majority of observers asked to respond to test material were representative of the middle income, educated strata of society. A much broader range is necessary to provide useful information in situations where diverse populations apply.

- Criterion 2--The system should cover the full range of aesthetic attributes.

  Methods developed by Appleyard (1971) and Peterson (1969) were designed to cover a wide range of aesthetic attributes, many of which were identified by respondents. Other methodologies reviewed had a restricted scope of aesthetic concern, considering only man-made or natural landscape features, thus offering limited information to decision makers.

- Criterion 3--The system should be theoretically sound and well documented.

Most methods were carefully documented, with experimental conditions and analytical tools sufficiently described for satisfying this criterion.

- Criterion 4--The system should reflect the reasons for expressed preferences.

  All methods reviewed did this.

- Criterion 5--A good technique will be straightforward and easily reproduced.

  Two of the five techniques required professional skills for testing and interpretation, thus restricting their adaptability. Winkel's methodology (1969) in particular was extremely complex, requiring special equipment (eye-mount cameras) and trained psychologist staffing. Appleyard's method (1971), on the other hand, was very adaptable to resources available in planning offices.

- Criterion 6--Information should be useful to decision maker.

  Four of the five methods reviewed provided very limited information on user preference because of the narrow scope of concern. However, all methods transmitted information in a useful manner--photos, cartoons or questionnaire tabulations.

Review of Aesthetics in Basic Research

Environmental aesthetics as a field of study is primarily recognized as a 20th Century activity. However, a number of recurring themes from past uses of aesthetic concepts have been interwoven into present day concepts. Basic theory in environmental aesthetics covers a wide range of subject matter which can best be described as studies directed toward understanding the unquantifiable aspects of the physical environment--in particular, understanding the impacts of physical arrangements upon social arrangements in the broadest sense, whether they are socio-physical or man-environment studies. "Socio-physical technology is one of several labels that have recently emerged to encompass issues of mutual concern to a number of designers and social scientists attempting to understand, or modify, the complex set of relationships that link individual and collective human behavior with features of the natural and man-made physical environment" (Archea, 1971).

Considerable research, development and implementation related to socio-physical technology has taken place recently in both private and public institutions. The Federal government plays an active role in the field by initiating and funding man-environment research. "Figures from 1971 indicate that the government funded 50 studies directly related to man-environment research, with an overall investment of perhaps $30 million" (Ford, 1971). The first study undertaken in this field was a survey of the Federal government's role in man-environment research, which included a 2,000-entry bibliography and summary of the status of projects both outside and within Federal government.

This initial effort was spearheaded by architect Andrew Euston, principal urban design program officer in the Environmental Planning Division of the Department of Housing and Urban Development (HUD), along with Thomas Thompson and John Archea as principal researchers. This program is presented in a seven-section review by Design and Environment, summer 1971 issues. Additional references include: "Socio-Physical Technology, a State of the Art Report," by Archea et al. (1971); "Socio-Physical Technology Workshop Proceedings" (1968); and "Observations Regarding Man-Environment Studies--Bibliography" by Amos Rapoport (1970).

Since aesthetics emerges as a predominant theme in much of the research of man-environment studies, an overview of the work that has been done and work that is currently under way is sketched here. The three areas of concern to be addressed are theories developed in the area of the natural environment, the social-psychological environment, and the man-made environment. These theories often overlap, but for purposes of discussion they will be presented separately. Conference proceedings, prepared bibliographies and literature reviews will be cited under each category. A detailed analysis of the literature is beyond the scope of this study; however, references will be made to research of particular interest to environmental aesthetics.

A few periodicals cover all three categories of basic theory. Articles in these journals are written at various stages of detail and directed to a more general audience: Design and Environment, Man-Environment System, Futurist, Ekistics, The Journal of Aesthetic Education, The Journal of Leisure Research, and the Journal of Regional Science. Conference proceedings covering the broad scope of aesthetic concern come from: the annual EDRA conferences (Environmental Design Research Association, Incorporated), American Institute of Architects (AIA), American Institute of Interior Designers (AID), and Industrial Design Society of America (IDSA) conferences, from the EPA conference on the quality of life, and from the annual 'Design Assembly' sponsored by the National Endowment for the Arts and Humanities.

The following state-of-the-art review is categorized according to theories where the focus is directed to more specific subject matter.

The Natural Environment

The attitude toward nature has undergone significant evolution in America since the first colonists landed. Nature in early Colonial days was often an obstacle to civilization--something to be subjugated for human survival. Today, with wild and natural areas becoming decreasingly available to the everyday human experience, the "back to nature" theme is gaining popularity (Nash, 1972). Aesthetics, once confined to the appreciation of the fine arts, today takes on a more widely felt appreciation of the aesthetics of nature. David Lowenthal (1962), in an article entitled "Not Every Prospect Pleases: What Is Our Criterion for Scenic Beauty?" talks about this evolution of attitudes toward nature and beauty, concluding that the aesthetic impact of a natural scene will ultimately be biased by our previous experiences. Hugh Iltis (1966) sees nature from a human evolutionary point of view and advances the hypothesis that the "urban, biologically artificial environment" may have a profound influence on the mental health and emotional stability of its inhabitants. He sees natural aesthetics as more than a luxury. In his mind it is "a genetic need of the human animal" (Iltis, 1966). In Design with Nature (1971) Ian McHarg devotes an entire chapter, "Process and Form," to natural form (the appreciation of which can be called aesthetics). In the widely read Sand County Almanac with Essays on Conservation from Round River (1949), naturalist Aldo Leopold expresses his love for nature and its beauty and the need for a land ethic to protect natural beauty. In "Yosemite: The Story of an Idea" (1948), Hans Huth discusses the nonutilitarian aesthetic emphasis (an uncommon one in the late 1800s that was instrumental in the formation of Yosemite National Park).

In addition to publications by the above authors, the subject of aesthetics from a naturalist point of view has been dealt with in numerous symposiums. The Forest Recreation Symposium, held at the New York College of Forestry in October 1971, deals with aesthetics in nature from a recreation standpoint. Of special interest is a paper given by Floyd L. Newby at the Recreation Symposium entitled "Understanding the Visual Resource" (Larson, 1971). A workshop sponsored by Resources of the Future, in cooperation with the University of Montana School of Forestry and the U.S. Forest Service Forestry Sciences Laboratory at Missoula, Montana, resulted in a group of papers published under the title Natural Environments--Studies in Theoretical and Applied Analysis (Krutilla, 1972). In this book, two papers by R. Burton Litton, Jr. and Kenneth H. Craik deal directly with the aesthetics of natural environments. Additionally, Hugh Iltis and Sharon Decker at the University of Wisconsin are preparing an annotated bibliography on "Man's Needs for Nature," a project funded by the Horticultural Research Institute, Incorporated.

The Social-Psychological Environment

Research in the area of social and psychological implications of aesthetics deals with a broad scope of study from individual perception to cultural manifestations of visual quality. Periodicals specifically addressing this subject are Environment and Behavior, Journal of Human Ecology, Architectural Psychology Newsletter, Psychology Today, Urban and Social Change Review, and Journal of Social Issues. A recent publication edited by Harold M. Proshansky, W. Ittelson, and L. Rivlin, entitled Environmental Psychology, Man and His Physical Setting contains a collection of papers which characterize the field of environmental psychology. It represents one of the most comprehensive collections available of up-to-date papers by established empirical scientists.

Independent research has been carried out on visual perception and the psychology of art by Rudolf Arnheim (1964, 1966, 1969); on perception and cognition by Gibson (1950, 1966), Festinger (1965), Saarinen (1969); on color and semantics by Drechsler (1960), and Pickford (1972); on behavior and spatial design by Lozar (1973), Preiser (1969), Acking (1967, 1969), Altman and Nelson (1972), and Winkel (1969).

Bibliographies of references related to the psychological aspects of environmental aesthetics are: "Environment and Behavior: A Bibliography" (Pastalen, no date); "Space and Behavior: A Selected Bibliography" (Heyman, 1964); "The Bio-Psycho-Sociological Effects of the Environment on Man: An Analysis of Currently Available Information" (Sabaroff, 1966); Bibliography: Physical Environment and Behavior (Spivak, no date); "Bibliography on Environmental Perception" (Lowenthal, no date); "Perception of Environment" (Saarinen, 1969); and "Environmental Psychology-References" (Craik, 1970).

Social manifestations of the visual quality in man-made and natural environment are addressed in books by Michelson (1970), Bauer (1966), and Wohlwill and Carson (1972), and in conference papers by Bechtel (1972). A journal covering this subject would be Urban and Social Change Review. Individual authors have written on the influence of social relationships in neighborhoods by site and architectural plans, such as Gans (1961), Rosow (1961), and Appleyard (1969); and on the ecological processes as a part of ongoing social interaction (Altman, 1967, 1970, 1971). Aesthetics is also an integral part of research concerned with identifying definitive parameters for measuring the 'quality of life' and for developing 'social indicators.' Studies on these subjects have been published by: House (1972), EPA (1972), Stanford Research Institute (1969), and New World Systems, Incorporated (1972).

Bibliographies of references concerned with the social dimensions of environmental aesthetics include: "Behavior and Environment: A Bibliography of Social Activities in Urban Space" (Bell, 1970); "A Selected Bibliography of

Writings on the Social Aspects of the Urban Physical Environment" (Michelson, no date) and "Social Implications of the Physical Environment with Particular Emphasis on Housing the Neighborhood Characteristics: A Bibliography" (Sanoff, 1970).

The Urban Planner

The single discipline most responsible for considering the impacts of "physical arrangements on social arrangements" is urban planning. Urban planning journals likely to include articles on environmental aesthetics are City, and the Journal of the American Institute of Planners and Urban Land.

A number of separate publications concerning urban forms with emphasis on the visual quality of cities have been written by Lynch (1968), Appleyard (1969), Mumford (1956), Wilson (no date), Okamoto and Liskamm (1967), Le Corbusier (1933), and Solari (1969). Others dealing specifically with the man-made environment are by Cohn (1970) and Reichek (1961). Publications concerned with land use planning have been written by Chapin (1965) and EPA (1973). Finally, urban planning for specific cities has been discussed by Jacobs (1971) and by Wolfe (1970). These publications present a few of the developing concepts in urban aesthetics.

Bibliographies of particular interest to the urban planner are included in Planning the Man-Environment Interaction (Campbell, 1970); The Urban Environment (Appleyard, 1972); and The Urban Landscape (Lynch, 1973).

The above listings represent a small sample of the available literature concerning various concepts in basic theory for environmental aesthetics. A complete information system similar to the one developed by John Martinson for the man-environment research survey would be a useful tool for future work in the field of aesthetic research.

VI AESTHETIC RESPONSIBILITIES IN THE ENVIRONMENTAL PLANNING PROCESS

This section of the report examines the current uses of aesthetic concepts in planning procedures. Although the use of aesthetics remains at an experimental level in Federal agencies, in state, regional and local planning departments, and in private planning firms or departments, the past few years have seen significant strides toward the development of the art. Through examining current planning practices in a wide range of procedures and decision settings, we can see how successful each has been, and what implementation problems have occurred in each case.

There is no existing standard or uniformly accepted framework for introducing aesthetic considerations into planning. The various agencies reviewed display a broad spectrum of approaches to the inclusion of aesthetics in the planning process. Each approach, however, represents only a portion of the planning possibilities. The NEPA and CEQ guidelines have provided some direction, but in general, agencies have relied on vague definitions and have not attempted to incorporate research methodologies into their programs. The following list has been developed to provide a comprehensive view of the planning and decision areas where aesthetic considerations may arise. It will serve as a tool for comparing the approaches and suggesting further actions.

Areas in which aesthetic impact can be considered include the following:

(1) Planning goals and objectives specifically directed to aesthetics

  (a) Defining the agency's general philosophical attitude about aesthetic resources.

  (b) Selecting the participants in the formulation of aesthetic goals

    - In-house staff
    - The public
    - Outside authorities.

(c) Specifying criteria used for judgment of aesthetic impacts.

(2) The agency's interpretation of Federal guidelines

In particular, the agency's response to the NEPA requirements of:

- Environmental design arts
- Interdisciplinary approach
- Aesthetics and visual quality
- Public involvement.

(3) The planning process as it includes aesthetics

(a) Level of experience of the staff members involved with design problems

- Staff members with design background
- Staff members untrained in design
- Outside professionals
- Interaction with other disciplines.

(b) Defining the problem

- Specifying the comparative importance of areas considered in the impact analysis.
- Identifying the internal effects to be examined (effects on project users).
- Identifying the external effects to be examined (effects on the areas and people surrounding the project).
- Examining the definition of the problem in terms of stated goals and agency attitudes.

(c) Assigning methodologies and planning tools to be used, and specifying their communication value for decision makers, staff and the public.

(d) Incorporating public involvement considering public interests

- Holding hearings (specifying timing, size, frequency).
- Incorporating other forms of involvement (e.g., user surveys).

    - Presenting information.
    - Recording feedback.

  (e) The existing channels for interagency communication on projects involving the interests of more than one agency.

(4) The evaluation process

  (a) The decision-makers

    - Are the decision-makers members of the planning staff?
    - If not, is communication established with the planning staff?
    - Can the design arts staff stop a project?

  (b) Outside pressures on the decision-makers, affecting the consideration given to aesthetics.

  (c) Assessing the weight given to aesthetic considerations in comparison with political, environmental and budgetary restraints.

  (d) Integrating public participation

    - Setting up communication channels between the public and the decision-makers.
    - Does the communication initiative come from the agency or from the public?

(5) Exploring the implementation methods available to the agency

  (a) Is the agency responsible for program implementation as well as planning?

  (b) Does the agency have any legislative powers?

  (c) Can the agency use zoning powers, permit procedures, or other ordinances to control aesthetics?

At this stage, an agency would not be expected to actively include aesthetics in all of these areas. However, each area could play a role in the development of a more complete analysis framework.

The following includes a selective, rather than exhaustive sampling of planning departments. The agencies reviewed have shown attempts to incorporate aesthetic concepts into their planning process. It was important to get a variety of planning types from private firms to Federal agencies, to demonstrate the wide range of agency involvement in the environmental issues that are responsive to the NEPA. In examining one or two examples from each level, needs, deficiencies, problems and possibilities can be addressed for each stage in the development of the field of aesthetic planning. A broad picture of the basic directions it can take is important for determining future roles.

The information presented in this section is a result of personal interviews with agency staff members responsible for environmental planning and project design.

Planning at the Federal Level

The National Environmental Policy Act had its most direct and immediate effects on agencies of the Federal government. The requirement that "All agencies of the Federal government shall review their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purpose and provisions of this Act" (NEPA Sec. 103) placed an immediate charge on Federal agencies to reorganize their planning programs in the direction of environmental analysis.

Aesthetic considerations began to appear in these reorganized planning processes, particularly in agencies whose actions have direct and powerful effects on the physical appearance of the country. Four agencies that consider aesthetics in their planning and program activities are the Department of Transportation, the U.S. Forest Service, the National Park Service, and the National Endowment for the Arts.

Each of these agencies shows an awareness of some of the issues of environmental impact, particularly in terms of visual effects. In examining the programs each is developing to deal with the aesthetic implications in its area of responsibility, differing environmental concerns appear. There is a tendency among agencies to concentrate on aesthetics solely within the format of traditional duties, e.g., aesthetics is one more factor to include in selecting a timber stand for cutting. Some may need to broaden their scope of interest to be able to do a complete, environmentally acceptable job of managing available resources, as traditional planning methods often fail to consider impacts outside the immediate project area--e.g., a flood control project. A study of the individual programs that are being tried, and the gaps each leaves unexamined, will give evidence of the influence Federal agencies may have on aesthetics through their planning effort, and how each agency might further its awareness of its planning implications.

National Endowment for the Arts

While the issue of aesthetics has become particularly apparent since the NEPA produced requirements for environmental impact considerations in planning, concern with aesthetic factors in development in the United States was anticipated on a Federal level by earlier legislation founding the National Endowment for the Arts as a branch of the National Foundation for the Arts and the Humanities. The National Endowment for the Arts, as an agency, affects planning and design through the financial aid it allocates for design purposes. Its philosophy for funding the arts is not standardized, and the agency acts as an example of continued support of individualism. Its purpose is primarily to encourage new cultural developments in the United States. This purpose is based on Congressional findings, as stated in the second section of the National Foundation for the Arts and Humanities Act of 1965, which included:

(1) that the encouragement and support of national progress and scholarship in the humanities and the arts, while primarily a matter for private and local initiative, is also an appropriate matter of concern to the Federal Government;

(2) that a high civilization must not limit its efforts to science and technology alone but must give full value and support to the other great branches of man's scholarly and cultural activity in order to achieve a better understanding of the past, a better analysis of the present, and a better view of the future;

(3) that democracy demands wisdom and vision in its citizens and that it must therefore foster and support a form of education designed to make men masters of their technology and not its unthinking servant;

(4) that it is necessary and appropriate for the Federal Government to complement, assist, and add to programs for the advancement of the humanities and the arts by local, State, regional, and private agencies and their organizations;

(5) that the practice of art and the study of the humanities requires constant dedication and devotion and that, while

> no government can call a great artist or scholar into existence, it is necessary and appropriate for the Federal Government to help create and sustain not only a climate encouraging freedom of thought, imagination, and inquiry but also the material conditions facilitating the release of this creative talent;
>
> (6) that the world leadership which has come to the United States cannot rest solely upon superior power, wealth, and technology, but must be solidly founded upon worldwide respect and admiration for the Nation's high qualities as a leader in the realm of ideas and of the spirit; ...

The goals of the National Endowment for the Arts are encompassed in the above purposes and serve as the basis for aesthetic considerations within the agency. This is a case of an agency serving the goals laid out entirely by an outside authority, the U.S. Congress. Some indirect public participation may have occurred in writing the act through citizen contact with individual Congressmen, however, there is no official provision for general public involvement in decision-making or in activities sponsored by the National Endowment for the Arts.

The basic duty of the National Endowment for the Arts is to fund projects that will induce national progress and scholarship in the arts. Criteria for selection of projects are limited to definitions of the nature of projects that might be funded. These are included in section 5(c) of the Act:

> (c) The Chairman, with the advice of the Federal Council on the Arts and the Humanities and the National Council on the Arts, is authorized to establish and carry out a program of contracts with, or grants-in-aid to, groups or, in appropriate cases, individuals of exceptional talent engaged in or concerned with the arts, for the purpose of enabling them to provide or support in the United States--
>
> (1) productions which have substantial artistic and cultural significance, giving emphasis to American creativity and the maintenance and encouragement of professional excellence;
>
> (2) productions, meeting professional standards or standards of authenticity, irrespective of origin, which are of significant merit and which, without such assistance, would otherwise be unavailable to our citizens in many areas of the country;

(3) projects that will encourage and assist artists and enable them to achieve wider distribution of their works, to work in residence at an educational or cultural institution, or to achieve standards of professional excellence;

(4) workshops that will encourage and develop the appreciation and enjoyment of the arts by our citizens;

(5) other relevant projects, including surveys, research, and planning in the arts.

No concise standards appear, however, for selecting projects that will serve to meet the desired ends. Knowledge of what constitutes "substantial artistic and cultural significance," "standards of authenticity," or of "professional excellence," or of what is needed to "develop the appreciation and enjoyment of arts by our citizens" is left to the decision-makers.

The funding decisions in this case rest in the hands of the National Council on the Arts (Sec. 6(b)). This group consists of a chairman and 26 members appointed by the President. The members are to include selected private citizens "who are widely recognized for their broad knowledge of or expertise in, or for their profound interest in, the arts," and professionals working in the arts, "so as collectively to provide an appropriate distribution of membership among the major art fields." Further advice may come from the Federal Council on the Arts and the Humanities, whose members include the Chairman of the National Endowment for the Arts and the National Endowment for the Humanities, the United States Commissioner of Education, the Secretary of the Smithsonian Institution, the Director of the National Gallery of Art, the Chairman of the Commission of Fine Arts, the Archivist of the United States, and a member designated by the Secretary of State. Through this group some interdisciplinary interchange is encouraged, if not required.

While the chairman of the National Council on the Arts is delegated the final decision power, he is responsive in all cases to the recommendations of the Council on the Arts. Decisions appear to be made entirely by representative "experts" in the fields of the fine arts. This is one method of providing a knowledgable *ad hoc* decision-making group where definite standards are difficult to devise.

The National Endowment for the Arts is in a peculiar position in relation to the projects produced. While the funding and therefore the decision powers rest entirely within the council, planning is the responsibility of individual outside groups on a project basis. Thus no definitive outline exists for directing planning methods. Some implicit values can be seen from the type of projects that have been funded, although funding may indicate support of a plan offered to the agency in the absence of competing plans, rather than one chosen by the agency from a field of possibilities.

One study funded by the NEA provides aesthetic values for designers, if not for the NEA's own decision-makers. This is a publication entitled *The Design Necessity*, which describes the directions of study of the First Federal Design Assembly. The conclusions resulting from this work are worth examining, as they provide one general value guide that describes aesthetics in planning. This approach is a practical one, delineating the advantageous effects of design without discussing the question of inherent aesthetic values:

> The Assembly program discussed the necessity of design in visual communications, in interiors and industrial design, in architecture, and in the landscaped environment. Design was considered as an instrument of organization, a medium for persuasion, a means of relating objects to people, a method for improving safety and efficiency, and a way of coping with the complexity of contemporary Federal Agency assignments.
>
> The Assembly's emphasis, then, was on design *performance* in response to human needs. (Chermayeff et al., 1973)

The approach to aesthetics is pragmatic. The problem faced is how to use design effectively. The purpose of examining specific projects is to document ten points in favor of design:

(1) That there are sound, proven criteria to be applied in judging design effectiveness.

(2) That design is an urgent requirement, not a cosmetic addition.

(3) That design can save money.

(4) That design can save time.

(5) That design enhances communication between people.

(6) That design simplifies use, simplifies manufacture, simplifies maintenance.

(7) That the design necessity is recognizably present in projects ranging in scale and complexity from a postage stamp to a national highway system.

(8) That the absence of design is a hazardous kind of design. Not to design is to suffer the costly consequences of design by default.

(9) That, on any given project, designers and Government officials are committed to the same basic goal: performance.

(10) That effective design of public services is itself an essential public service. (Chermayeff et al., 1973)

There are no criteria for how the design process is accomplished. The emphasis of the study is on the final products. The programs reviewed reflect this approach. Projects ranged from a mini-folder program of the National Park Service to environmental design on the scale of schools, offices, apartment cooperatives, and an airport. Most design was conducted on a completely professional level, although a few projects included outside citizen input. One example was the Acorn School project, where both the initiative and the goal preparation came directly from the parents, although many of the actual design decisions were made by professionals. In all cases, the design of the project had significant influence on its value to the users.

In encouraging an interest in visual design, the National Endowment for the Arts is taking a large step toward giving aesthetics a place of importance in the public domain. However, the direction it offers nationally is as yet undeveloped. The contribution to environmental analysis stems primarily from the emphasis placed on the importance of design.

From an objective standpoint, in terms of the goals, objectives, and guidelines stated in the National Foundation on the Arts and the Humanities Act of 1965, the NEA is following the functions assigned to it. Its basic purpose is educational and this function seems well served. More specific aesthetic criteria could be developed, but these might limit innovation by artists and designers individually and in agencies where new ideas are of great importance. The real mission of NEA is to encourage the cultural development of the arts, and it does appear to be doing that.

Guidelines for evaluating impacts are particularly important in agencies responsible for physical changes affecting the environment on a national scale. The Department of Transportation, the U.S. Forest Service, and the

National Park Service have well-defined areas of responsibility for directly controlling project impacts and resource development. Because aesthetic changes are more easily definable when tied to a specific site or problem, more definitive guidelines can be considered. Attempts at developing more specifically worded guidelines for planning have been developed by the following three Federal agencies.

Highway Planning in the Department of Transportation

The role of the Department of Transportation at the Federal level is mainly directive and advisory. Actual project planning occurs on the state or local level. The Department of Transportation sees its role as one of encouragement for considerations of aesthetic values through its departmental guidelines and procedural directives for environmental impact statement review and in the Federal Highway Administration by requiring each state highway division to accept the responsibility for impact analysis and document this process in the State Action Plans.

The Federal Highway Administration, more than any other single agency, has invested considerable effort in the task of considering aesthetic effects of highways. Over the past three years in particular, a great deal of effort has gone into developing guidelines and directives for this activity. Papers, seminars and memoranda during this period often discussed the problem of aesthetic impacts in highway construction and use.

The official DOT guidelines for environmental impact review follow the Council on Environmental Quality guidelines closely, offering nothing further to delineate aesthetic concepts. On the October 1971 Order on Procedures for Considering Environmental Impacts, aesthetic effects appear only implicitly as a subset of possible "consequences adverse to the environmental goals set out in Section 101(b) of the Act" (DOT 5610.1A, p. 11).

Guidelines for developing State Action Plans offer little more aesthetic guidance. The strong environmental effects of transportation systems are recognized with aesthetics as one area of impact consideration. This is provided for in the Federal Aid to Highways Act of 1970:

> Key provisions of section 109(h) direct the Secretary of Transportation to submit to Congress by July 1, 1972, guidelines to assure (a) that possible economic, social, and environmental effects relating to proposed highway projects are fully considered

in developing highway projects, and (b) that final decisions on highway projects are made in the best overall public interest taking into consideration:

(1) Need for fast, safe, and efficient transportation.
(2) Public services.
(3) Costs of eliminating or minimizing adverse effects.

Certain adverse effects are listed in section 109(h):

(1) Air, noise, and water pollution.
(2) Destruction or disruption of manmade natural resources, esthetic values, community cohesion, and the availability of public facilities and services.
(3) Adverse employment effects, and tax and property value losses.
(4) Injurious displacement of people, businesses, and farms.
(5) Disruption of desirable community and regional growth. (Manheim, 1972)

Provision is made in the guidelines for a general approach to the consideration of impacts. The process description in the directive for State Action Plans gives more explicit direction to planning by requiring evidence of methodologies for assessing, controlling and monitoring environmental conditions, along with an adequate outline of the procedure for environmental assessment.

The Report to Congress on Section 109(h), Title 23, United States Code, of August 1972, discusses the development of the guidelines on economic, social and environmental effects of highway projects. Originally, attempts were made to include detailed guidelines applying to particular effects. However, in the course of preliminary studies, the conclusion was reached that:

> ... the whole range of material must be considered with respect to each project, and this could impose an unduly burdensome requirement for official guidelines (Manheim, 1972).

As a result, in-department memoranda give a more detailed picture than the legislated guidelines of the DOT's concerns with aesthetics. Because of their often unofficial status, the suggestions do not necessarily lead to action. Nevertheless, they are valuable as indicators of directions in which DOT planners are thinking.

Before discussing these developments, some mention should be made of the overall planning process of the DOT. As has already been stated, the major planning effort occurs on a state or local level. Most decision-making occurs there as well, with the exception of controversial cases. The DOT's Federal Office may review state decisions where a state or local government has failed to follow procedural recommendations, and further planning work may be demanded.

Public participation in plan formation is required as an integral part of the planning process. This concept was emphasized by Marvin Manheim in his work in the decision-making field. In the Report to Congress previously cited, one set of principles upon which the Process Guidelines are based is:

> Full consideration of economic, social, and environmental effects as well as decisions in the best overall public interest, depends to an important degree upon involvement of the public. Highway agencies should, therefore, work to search out differing viewpoints and to secure the participation of a wide variety of groups. Failure to do so could result in a distorted picture of public reaction, perhaps overemphasizing either support or opposition. Furthermore, many highway effects can be judged only in relationship to local values which will differ from place to place. Thus, a community's degree of attachment to a local landmark within a potential right-of-way might be known only to neighborhood residents. Or a highway's stimulus to community growth could be welcomed by city A but opposed by city B (Manheim, 1972).

This idea of the importance of the public voice reaches further concrete dimensions in a recent article by Manheim on "Reaching Decisions about Technological Projects with Social Consequences: A Normative Model" (Manheim, 1973). In it, he develops the concept of a planning team as a tool for achieving substantial effective community agreement on a feasible, equitable and desirable course of action. "The role of the technological team is to clarify the issues of choice, to assist the community in determining what is best for itself" (Manheim, 1973). Process strategy is divided into four stages, and each is based on the type of citizen input required. The first stage consists of initial surveying by the technical team, collecting basic data on the interests, needs, and desires of all potentially affected interest groups, and should result in an initial statement of issues and goals. In the second stage, issues are analyzed through a program of direct interaction with the community. This is succeeded by a stage of design and negotiation, in an attempt to produce substantial agreement among interest groups on a single alternative. Finally, either the agreement is formalized or the technical team makes a recommendation based on its knowledge of the conflicts, leaving the final decision to the legal authority.

In this type of planning procedure, aesthetics issues can be expected to appear at all stages. The purpose of aesthetics analysis by experts in the department would be to clarify the issue implications for the involved community. The work that has been done so far in the DOT towards analyzing aesthetic impacts has not been directed toward public information and participation. Instead, it tends to be complex and sophisticated, relying on advanced state-of-the-art hardware and knowledge for communication.

Methods will no doubt be developed consistent with Manheim's philosophy and adopted policy to reflect the emphasis on public involvement.

The following approaches for considering aesthetics appeared mainly in memoranda within the Department of Transportation, as preliminary ideas for Action Plan Guidelines. Further work may have been done since then, with the result that some gaps mentioned here may now be covered. The summary is not intended as a criticism of current practices in the DOT, but as an analysis suggestive of the process to date for impact assessment.

The discussions on aesthetics have focused on two basic problems: (1) the place of aesthetics in transportation planning (particularly for highways), and (2) an outline of specific impact elements related to aesthetics and of a procedure for considering them. The first provides a foundation for further planning; the second begins to approach the problem of assessment and communication tools.

The Highway Research Board Environmental Workshop in July 1971 outlined five recommendations for the place of aesthetics in the planning process:

(1) Aesthetics is the responsibility of all design professionals.

(2) Beauty should be treated as a real human need.

(3) The highway can offer a sense of completeness.

(4) Aesthetics must be considered at all stages, and interdisciplinary teams should be used at all levels of planning with the affected communities involved at various stages.

(5) Aesthetics is a part of the need for adequate right of way. (Klein, 1971)

This supports a general approach to aesthetic analysis as a responsibility of the DOT planning staff.

The problem is considered in more depth by individual members of the DOT staff. The approach is broad, with mention of general concepts, but without reference to the current theoretical research developments.

In a statement on Environmental Guidelines for Aesthetics, Ms. Mickey Klein wrote that "To achieve harmonious and graceful functional visual relationships with the built and natural environment, aesthetic resources and possibilities shall be identified and evaluated at each phase of the planning effort" (Klein, 1971). Harmony and grace are accepted as necessary considerations in highway planning. This supports the idea that "the highway can offer a sense of completeness or fulfillment." The points where beauty becomes a concern in highway design can then be delineated. These include location, alignment, cross-section, scale, environmental impact, architectural detailing, and landscape development. For each of these areas, the existing situation can be compared with alternatives for development and changes affecting aesthetic resources can be assessed.

Design is recognized as affecting two impact zones. One is the highway zone, which is composed of the area perceived from the roadway. The other is the neighborhood zone, the area from which the highway can be perceived. Both areas must be considered, and "in especially significant cases, the use of a design review board is recommended, representative of the highest professional judgment in the affected community" (Klein, 1971).

This approach used for defining the physical areas considered in aesthetic impacts begins to define the problem of the total effects of a highway system, but still leaves unconsidered the area of secondary effects--the type of development that will be induced in areas served by the highway and the ensuing aesthetic impacts. In the continuing discussions among DOT staff on the subject of visual impacts, this consideration never appears. Yet once recognized, it cannot be denied as an important area in weighing the costs and benefits of a project.

The integration of aesthetic and visual values into the development process is important, whichever impact areas are considered. Some thought has gone into what aesthetic elements work as forces on a highway. These are well presented in a report on "Guidelines for Incorporating Factors of Aesthetic and Visual Impact into the Planning Process of Transportation Systems" by Martin Redding. The use of these elements can be expanded at any time to allow for consideration of broader impact areas.

Four steps are identified in the process of relating visual factors with values of aesthetic merit:

(1) Inventory, to identify visual components.

(2) Analysis, to determine the degree of relevance of each element (this would involve both local input on the importance of each element to the community, and some analysis of how the elements affect the driver's needs).

(3) Evaluation, to summarize the environmental values involved in the plan.

(4) Interpretation, to develop a strategy "to maximize the amount and distribution of relevant values which meet objectives for highway planning." (Redding, 1971)

Some directions for inventory and analysis are discussed in detail. For the most part, these deal with the highway user.

The importance of aesthetics to the driver is very practical. The visual factors of a highway landscape are essential to the driver's performance. Visual components are related to several aspects of driving. These include elements affecting the tasks of the driver, such as vehicular controls, navigation, environmental awareness, and aesthetic and emotional experience; the visual scales associated with driver activity, such as the foreground (right of way), middleground (route), and background (corridor); and the driver's objective, which "sets out the plan that leads to tools and techniques to link drivers' tasks and needs operationally with environmental factors for their solution" (Redding, 1971).

Sequences are not developed for considering impacts on the highway neighbor, but they could be a useful addition to the preceding method for analysis. The report assumes that "when considering the view of the highway as from the highway neighbor, the highway is generally aesthetically acceptable when it conforms to the natural landscape." To compensate for the subjective values upon which this depends, recommendation is made for the development of relative values of aesthetic merit. The values would consider the intended use of the highway, the regional areas's visual characteristics, what the driver sees and reacts to, and attempts to identify the optionally significant elements over each phase of development. Evaluation procedures involve graphic methods and techniques emphasizing sequential and comparative values.

These merits will have limited applications, as the method is applied to only one area of neighborhood impact--the direct view of the road. To get a complete picture of the aesthetic impacts of highways, considerations would need to be broadened, to include the secondary effects of highway development on the livability of surrounding areas. Many, but not all, secondary effects are visual.

The analytical tools suggested are not limited to graphics. Three-dimensional models are mentioned as an important method of viewing an affected area, in terms of both existing impacts and the alternative plans. Both graphics and models serve the purpose of public communication as well as professional analysis, when applied in that area. Actual application, however, lies with the highway departments of the states, and will be discussed further under the pertinent heading.

The preceding recommendations have had no formal channels for implementation. To see how much aesthetics influences actual decision making, it would be valuable to look at actual cases or projects, and the related official documents covering planning recommendations (see Appendix).

In practice, highway planning could still develop much further toward introducing aesthetics into its planning process and determining how aesthetics values should be recognized and weighed. Part of the problem seems to lie with the difficulty of coordinating the suggested evaluation procedures for a specific problem, such as aesthetics, with the other technical management practices, such as those proposed by Manheim. Some framework may be needed to coordinate department recommendations at either end of the planning process. The inventory procedures, relating to impacts, that have been mentioned could be developed further, with more specified connection to citizen input in information gathering. Some help in this direction could come from the theoretical research methodologies which have been developed recently. Much of the implementation of these methods is left to individual states, but technical assistance from the Federal level could make the results more successful.

All of the direct actions of the DOT seem to be based on the idea of man's impact on nature. Aesthetics is considered in terms of how the environment can be used for man's benefit without producing man-made structures that are incompatible with the natural environment. Aesthetics enters here primarily as a practical value, serving man. This is a natural result of the developmental orientation of the DOT. The highway is inevitably an intruder into an already established territory. Adjustment of transportation needs to the complete development setting will continue to be an important consideration in future policies.

The U.S. Forest Service

Aesthetics, in the context of visual quality, is a primary topic for concern by the U.S. Forest Service. The Forest Service was originally set up to manage the use of timber resources on Federal lands, including lumbering activities. John R. McGuire, the Forest Service chief, has stated that "We have to pay attention also to a new consideration--esthetics. If clear-cutting is the most profitable and convenient way of harvesting for the lumberman, but will be a blot on a formerly fine landscape, the clear-cutting will have to be overruled by esthetics" (Bloomfield, 1972). This attitude expresses a response in part to the increased recreational use of national forests, and their value as a scenic resource to surrounding communities and visitors. The criteria for receiving funding for preservation rather than marketing purposes generate from this change in attitude. "The basic philosophical approach to managing the U.S. National Forests reflects a trend toward subordinating human activities to nature, with emphasis on preserving the natural quality for human appreciation. Man is considered an actor in the environment, rather than the director" (Mittman, 1973).

Design considerations in the U.S. Forest Service are a part of every planning decision. This is accomplished through active participation by a representative of the "design arts" (usually a landscape architect) on the planning team for the proposed project. Project proposals originate at the level of the individual National Forest, in most cases, where planning teams are composed of members from each of the relevant disciplines (this often depends on the type of project being considered); usually including a geologist, hydrologist, plant biologist, and landscape architect. (There are almost 200 landscape architects covering 150 National Forests.) Many of the larger forests have representatives of these disciplines on their staff, but if they don't, each National Forest region has a headquarters staff of specialized personnel who are assigned to serve particular forests in the region when needed. Planning activities are thus conducted by interdisciplinary teams and the plans are submitted to the Regional Forester for approval. At this stage, each proposed project is reviewed by an interdisciplinary team (of which at least one landscape architect is a part) and recommendations are made. The Regional Forester in this case is the decision maker, but he is in a direct line of communication from his staff, thus providing an opportunity for considerable influence from trained team members, including landscape architects.

One of the major concerns of the "design arts" specialists is landscape design and visual assessment of proposed activities within the National Forest environment. Some detailed approaches for this have been developed, providing a direct means for including visual concerns in forest management.

Following the passage of the NEPA, the Forest Service developed an Action Plan to incorporate the values expressed in the Act into its approach to three main responsibilities.

(1) To develop, manage, and protect the National Forest System. These public lands include 187 million acres in 154 National Forests, 19 National Grasslands, and other areas located in 44 States and Puerto Rico. Resources on all of these units are managed directly by the Forest Service.

(2) To conduct basic and applied research in forestry and related fields. This work is conducted at 80 locations throughout the United States, often in cooperation with university and other research agencies.

(3) To cooperate in programs designed to improve the protection, management, and use of forest lands and resources in State and private ownership through technical and financial assistance to State forestry organizations and other cooperators. (USDA-FS Action Plan, June 1972, p. i)

Actions were proposed in a framework of thirty recognized problems occurring in the management of timber productivity.

Four of the problems identified have direct aesthetic application, and describe the visual goals of forest management in some detail:

Problem 1: "To increase Forest Service sensitivity to aesthetic values in planning and executing timber harvest, road construction, and site preparation" (p. 5). Actions needed in this area include training personnel to recognize aesthetic values, considering these values in planning functional activities, and establishing guidelines for protection.

Problem 2: "To recognize these areas where timber will not be harvested because there is no suitable alternative to clearcutting and environmental impacts make clearcutting unacceptable" (p. 7). To serve this end, the crucial areas need to be identified. Training is again important, as well as data collection. Furthermore, there is to be no harvesting in areas where the impact will be unacceptable and no alternative methods are feasible.

Problem 3: "To design and apply silviculture treatments to selected road foregrounds that will perpetuate appropriate species in good health and provide an attractive roadside" (p. 9).

Action in this area requires a statement of aesthetic and other objectives for the area, and directed use of the road foregrounds accordingly.

Problem 4: "To develop within the Forest Service special sensitivity to the need to manage resources, including timber, adjacent to wilderness or lands having special scenic and recreational attributes with recognition of the recreation values" (p. 49). The proposed approach to this problem works toward scheduled participation in interdisciplinary planning, training in resource examination and prescription development, and the identification of areas that will require multiuse planning.

These four problems provide the framework for consideration of aesthetic values.

Personnel training and area identification play a major role in the recommended actions. Steps have been taken by the Forest Service towards providing the analytical and informational tools needed by landscape personnel for their assessment. This is handled in the area of landscape management.

The purpose of landscape management is to achieve a balanced use of the natural resources for providing both utilitarian benefits to satisfy man's perceived physical needs and the cultural benefits serving psychological needs. The program works through using detailed visual analysis of landscapes and applying definitive decision-making guidelines (see Appendix).

Visual Analysis Tools

Analytic methods applied to visual resources are described in manuals put out by the U.S. Forest Service. Elements considered can be divided into several categories, including the components of visual resources, the seeing process, and variable factors.

The components of visual resources concentrate mainly on elements in nature--flora, fauna, land, water, and air. Artificial objects are considered as a sixth component. The importance of each of these to the landscape can be analyzed in terms of its effects on the seeing process, as manifested through the following features: color, surface, texture, slope, form (shapes and edges), and interspaces.

Depending upon the particular landscape, any one of the elements of seeing may be dominant. An analysis to determine which element is dominant is directed by the consideration of several principles: contrast, sequence, axis, convergence, codominance, and enframement. Once the method of dominance has been determined, the impacts of proposed actions become clarified, and recommendations can follow.

Before the process is complete, further analysis is included to determine the effects of variable factors on the dominant landscape element. A landscape changes appearance depending on motion, light, atmospheric conditions, season, distance, observer position, scale and time. Once the landscape has been defined by these factors as well as by visual components and seeing elements and principles, a firm basis of knowledge is provided for ensuing decisions.

Impact Determination and Decisionmaking Guidelines

Impact on the visual resource is analyzed on two levels, first in terms of the complete visual effects and second in coordination with other resources.

The U.S. Forest Service outlines seven basic alternatives for managing visual resources--deterioration, destruction, preservation, enhancement, retention, modification and rehabilitation. These follow R. B. Litton's approach to landscape inventory. A proposed development may be described in terms of which of these visual effects is produced. In general, deterioration and destruction are to be avoided if at all possible, while the acceptability of other alternatives depends in part upon coordination with other resources.

Broad bases for design decisions are provided through a method of illustration and weighting of cultural and utilitarian considerations. Different possible harvest procedures are considered against different types of landscapes, and the expected effects in each case are illustrated by sketches. Positive and negative effects are outlined for both cultural and utilitarian benefits. Finally procedural recommendations are made for the area of application of each method.

The decision process receives further modification when other resources are included for consideration. A basic outline is provided describing the types of resources that would be subordinate to visual considerations, and important enough to bypass visual considerations. Mining and the exchange and purchase of land may be overruled by visual resource protection. Recreation, timber and soil use are expected to coordinate fairly well with visual qualities when planning occurs in a multidisciplinary arena. Fire control, water quality, and range and wild life are considered important enough to overpower any conflicting visual considerations. This gives specific direction to decisionmaking (Cal. Region, U.S. Forest Service, March 1973).

The developed methodology is applied to individual projects by the landscape architect, as part of a management team. As outlined earlier design decisions go through the district ranger, to the forest supervisor, and finally to the regional forester. Final decisions are made at a regional level, and the landscape architect may extend his advice directly to that level if he feels that it has not received adequate consideration by the district (see Appendix).

The U.S. Forest Service has begun to produce valuable material in the field of aesthetics, in both project analysis and implementation. The dominance of the natural environment in the goals and objectives of the agency produces a strong interest in aesthetic resources, thus setting the scene for its consideration in planning.

Because public involvement is not an obvious inclusion in stated guidelines and seems to be minimal with most projects, decisions are made within the Forest Service staff, with the advice of its design professionals. Thus many decision conflicts which plague other agencies are avoided.

Citizen or user input is not provided for in any of the assessment plans, and does not appear in the planning projects on any regular basis. This is due in part to the lack of much public orientation towards many of the small issues that may arise. There may be strong reactions when a well known area is threatened by substantial change. However, the forest management team is still faced with the problem of recognizing what users value in a National Forest. This type of recognition cannot come solely from professionals in design and planning. Some efforts are beginning for analyzing wilderness use by survey methods (Lucas, 1971). These could be expanded towards the goal of providing scales of user preference to work in conjunction with the visual analysis that is already well established.

The National Park Service

The National Park Service has developed a procedural, rather than an analytical, set of guidelines for park development.

> The National Park Service believes in the individual creativity of its employees and consultants. Moreover, units of the National Park System are so diverse in size, purpose, visitation, and resources that few standards, in the usual sense of the word, apply. Hence, in place of rigid manuals prescribing how a person should do his job, or what a particular activity should entail, the Service develops broad functional standards. These standards prescribe the conditions that will exist when the various activities have been accomplished satisfactorily. This philosophy of management is particularly applicable to professional services, for manuals cannot stimulate or replace creative planning, design, and engineering solutions (National Park Service, Denver Service Center, April 1973).

This supports a philosophy of bold, imaginative design. The development that occurs may serve an artistic as well as utilitarian purpose, and may stand out as an addition to the natural area.

The Park Service is divided into six regions, consisting of 290 park areas. A master plan is required for each area. Park administration occurs on three levels, local, regional and national. The regional director is responsible for approving the master plans for his region.

Planning or special design needs originate at the local park level. The forest ranger notifies the regional director and the Denver Service Center. All planning, design and construction supervision takes place at the Denver Service Center, where professional design input comes from 46 landscape architects. Outside consultants are often hired in addition. They are not selected by competitive bidding, but on subjective elements such as competence, design excellence, sensitivity to environmental factors, and strong philosophical understanding of National Park values and problems. Interdisciplinary planning occurs at this level, with engineers and ecologists working with designers on individual projects.

A preliminary handbook for the Denver staff is being prepared, in-house, that consists of proposed planning and design standards for:

(1) Descriptions of the plans required for each project;

(2) The procedures necessary in the development of each plan; and

(3) Additional design materials necessary for communication purposes.

The required planning steps are carefully outlined through the combination of these three types of approaches.

Park planning begins with recognition of an area as nationally significant. "National significance is ascribed to areas which possess exceptional value or quality in illustrating or interpreting the natural and cultural heritage of our nation" (NPS, DSC, April 1973). Aesthetics would enter into the selection process as a basic measure of quality. However, decisions on quality are not directed by many standards, and are left to the members of the Advisory Board on National Parks, Historic Sites, Buildings and Monuments. After the significance study, a Master Plan is developed.

> A master plan is the conceptual planning document which, consistent with congressional and administrative policies, establishes the guidelines for the overall-use, management, and development of an area in the National Park System or proposed for inclusion in the System. It identifies the purposes of the area; its resource values; its relationship to regional environs; what human needs it should meet; the objectives for its management; management category; a land classification plan; and the general land use plan for its management, development, and interpretation (*Handbook* draft).

The Master Plan is a synthesis of background data and previous studies to give a context for future development. It should include an analysis of the resources in terms of their environmental setting, local, regional, and national needs, the ecological, social and developmental limitations or visitor use, and internal and external factors that might threaten the park resources. It serves mainly as a statement of goals and objectives for the area.

Project planning procedures follow in the action plans. This category includes five different plans: a Wilderness Plan, Legislative Support Data, Interpretive Plan, Concessions Management Plan, and Development Concept Plan. These five plans work in conjunction with the Master Plan to form a Comprehensive Plan for the area, which covers the concerns of a broad range of disciplines.

An Environmental Impact Statement is prepared while the Action Plans are being developed. The National Park Service has directed the impact assessment process towards working as an integral part of this planning system.

> These environmental assessments are required by the National Environmental Policy Act for any proposed action significantly affecting the environment or which may be controversial. To comply with the spirit, as well as the letter, of that Act, the Service prepares environmental impact statements on all basic planning products when basic environmental decisions and alternatives are being weighed, rather than on individual projects. Moreover, the Service views environmental impact in the broadest sense--social and economic, as well as ecological. In addition, the Service insists that these environmental assessments be conducted concurrent with, not as an afterthought to, the planning process (Handbook).

The National Park Service's EIS process provides an entrance for public participation into the planning process. Generally, an informal public meeting is held with no official notice; official hearings are held for all wilderness areas.

No provision is made for aesthetic criteria in the impact assessment process. Although "the action approved by the responsible manager is taken only after all environmental factors have been considered," there is no checklist or other method provided for defining the environmental factors that should be considered. There is no evidence that visual elements are considered comprehensively at all, until after Action Plans have been developed. Aesthetics on a broader scale of "culture" may enter for consideration in terms of historic preservation. "The mere fact that about two-thirds of the units of the National Park System are managed as historic areas underscores the importance of identification, preservation, and interpretation of cultural resources. Moreover, practically all other areas of the System, natural and recreational, contain cultural resources of varying value. Accordingly, standards for preservation of archeological, historical, and architectural resources are established to guide the Service's planning and design activities." Beyond this, design considerations do not appear until the preliminary planning procedures are completed.

A phase of comprehensive design follows the Comprehensive Plan.

> This activity is concerned with design of all physical developments within a park developed area, or a cohesive, unified

> portion thereof. For a small park, this may involve the whole park. Not only does a comprehensive design deal with architectural components, but utilities, roads, and landscape development as well. Thus, these designs attempt to pull together all such elements to insure maximum visitor enjoyment, economical and functional relationships, and esthetic and "spiritual" continuity (Handbook).

The comprehensive design must provide definite direction for the construction that will follow. It must respect the site conditions, present alternatives with recommendations, reflect the spirit of the preceding planning decisions, "complement the visitor experience, both physical and social, ... commensurate with the quality and spirit of the park," interrelate facilities in a "tasteful, honest, harmonious, and nonimitative way," determine materials, sizes, finishes and other elements as a basis for construction drawings, estimate costs, and provide a clear graphic, complete presentation towards decisionmaking. The comprehensive design is meant to fulfill very specific purposes towards directing development. The standards of value chosen to direct each step are left entirely to the design team.

Both survey and graphic techniques are described in some detail. Surveys are limited to photographs from the air. They may be needed at any stage of the park management process. Graphics serve the important purpose of communication. Efforts are made to keep the presentations clear, simple and directly related to the plan or design being discussed. They are "produced for the broadest application possible" and thus support the flexible nature of National Park Service's approach to planning.

The National Park Service's planning process is notable for its deliberate attempt to eliminate all rigid standards from its environmental assessment procedures. There are no methodologies recommended to the planner for use in environmental assessment. This is in direct contrast to the U.S. Forest Service's strict standards for forest development.

This approach can have two possible effects on aesthetic considerations. First, by providing an open field for development, it may permit positive innovations and developments that are otherwise stifled by strict standards. However, it may also hide the aesthetic import of plans that develop for economic or other reasons. A balance of aesthetic values with other elements of import to society will be difficult to achieve in this type of planning, because no comparative measures have been developed.

Imagination and sensitivity are useless to the planner if he has no method of analyzing the basic material which he must work with. The distinction must be made between directing design developments to the point of dullness, and providing a basis for analyzing the environment, and thus determining why park areas are different, and how these differences might be enhanced.

The Federal agencies discussed to this point are concerned mainly with impacts of proposed activities on the natural environment. Two Federal agencies involved with planning activities in the urban environment are the General Services Administration (GSA) and the Department of Housing and Urban Development (HUD). Both of these agencies are directly responsible for building construction where aesthetic concerns become important factors in the landscape and architectural design of the facilities. Although neither of these agencies has fully developed its respective environmental analysis procedure (as evidenced by the guidelines) nor assumed much responsibility for aesthetic considerations directly, both agencies have demonstrated considerable concern for social and economic considerations that could possibly be tied to aesthetics. A review of their limited involvement follows.

General Services Administration

The General Services Administration (GSA) was formed for the purpose of managing government property, from office supplies to Federal buildings. The Public Building Service (PBS), as one of the four GSA services, is involved in environmental planning through its real property and building responsibilities. PBS is responsible for both development of new Federal buildings and upkeep and reconstruction of older ones. GSA has responded to the requirements of the NEPA by considering the importance of a building's effect on a total environment, in terms of social and economic, as well as physical effects. Evidence of this is demonstrated in both environmental impact assessment procedures and research model development for impact assessment. Aesthetic criteria, and visual standards in general, do not appear in either assessment procedures or current research. Social and economic effects remain the major consideration for development analysis. One site evaluation model now being developed for impact assessment is based almost entirely on available census tract data (Kachura, 1973). Urban areas are delineated in an effort to determine where Federal buildings might maximize social and economic benefits. Little attention is given to aesthetic considerations in the proposed model (primarily due to the lack of quantitative data amenable to modeling) which might influence the final location decision or subsequent construction.

Design decisions are made primarily at the Regional level. The central PBS office provides little guidance or review in this area. Proposed new buildings are designed by local architects selected competitively by community design boards. Most reconstruction and additions to older buildings, however, are designed within PBS central offices. There are no uniform design criteria or systematic review procedures for regions or local architects to follow. While GSA's basic policy in the design of public buildings is that "due consideration will be given to excellence of architecture and design" (GSA, 1973), the evaluation of design quality is left to the discretion of local review boards, with little guidance from the Federal level. For an agency responsible for the design and design supervision of some 1,200 projects a year, the lack of any design standards seems to indicate a failure on GSA's part to fully recognize their responsibility for the visual quality of the urban environment.

Department of Housing and Urban Development

The Department of Housing and Urban Development is concerned primarily with funding housing developments throughout the country. It provides no planning guidelines for these projects on a Federal level. In general, the planning decisions are left to the discretion of local planning agencies. The Federal Housing Administration applies to HUD projects that require minimum property standards and building codes, but these deal largely with hardware, safety, health and other specific requirements established by FHA.

Aesthetic considerations do not appear in the published environmental impact guidelines. However, there is an incentive program that includes aesthetic considerations for individual projects. This is a "Design Award Program," where projects are judged by a jury picked from the private sector. Awards are made yearly for outstanding project design.

More work has been indicated by HUD staff in the future, towards the development of standards and guidelines for better design. The incentive originated from Operation Breakthrough, where four professional architects were hired to coordinate a project of volume-produced housing.

Operation Breakthrough was concerned with developing quick, competitively priced housing techniques, through the use of prefabricated building modules. The major considerations in the development of this project seemed to be economic and social. However, it also brought to the architects involved an awareness of the need for broad design standards. The same staff members are now developing research to further the formulation of design standards for HUD projects.

HUD, perhaps more than any other federal agency, has the opportunity of influencing the visual quality of the daily living environment in the urban areas of the United States. Encouraging an aesthetically pleasing environment would prove valuable economically and socially as well as psychologically. HUD has in the past been in a position (i.e., as a funding source) where it could have influenced design by requiring certain standards for funded projects. This possibility may no longer exist as revenue sharing passes many of HUD's responsibilities over to state and local agencies; therefore HUD will have to redefine the scope of its influence in urban design.

Planning at the State Level

The individual state governments have limited influence for ensuring that aesthetic considerations are incorporated into planning procedures. Legislation and planning guidelines are the two main tools available to states. These are often very broad in scope and only vaguely defined. Little planning or actual project development takes place at the state level. The implementation of aesthetic criteria is primarily left to regional or local agencies.

The first major step some states have taken has been to pass Environmental Quality Acts, echoing the NEPA requirements and expanding their application. Two states, California and Wisconsin, have been reviewed in some detail for this study.

Wisconsin's Environmental Quality Act directs agency consideration of environmental impact within the state to "include in every recommendation or report on proposals for legislation and other major actions significantly affecting the quality of the human environment, a detailed statement, substantially following the guidelines issued by the United States council on environmental quality" (Chapter 274, Laws of 1971). The NEPA 102C procedures are required at this level, with an additional statement on the short- and long-term beneficial aspects of the project.

A series of seminars at the University of Wisconsin attempted to identify further areas for state direction of planning. Aesthetics is mentioned briefly in this process, in terms of objectives and of guidelines, but it is never defined. The recommended guidelines are to direct analysis and project development in counties and local agencies. The most specific recommendation for aesthetic considerations is evidenced in a set of questions for assessing impact, such as "What individuals are affected aesthetically? (e.g., in terms of who, how many, how are they affected, when)" (Kusler and Alston, Dec. 1972).

The state government's most active role is in the actual review of environmental assessment. Even at this stage, its power over regional and local planning agencies is not clearly defined:

> The [Wisconsin] act provides that copies of the Statement be made available to the Department of Natural Resources (DNR) and the Governor. However, the act does not clearly set out the roles of the DNR or the Governor in terms of their review. The DNR could object to a project but it would have no political and budgetary power to stop it. Presumably the Governor could exercise considerable influence in preventing projects believed undesirable (Kusler and Alston, Dec. 1972).

The State of California is similarly limited in its powers affecting planning. The California Environmental Quality Act of 1970 has adopted the NEPA standards for application at the state, county, and city level, as well as private developments of significant size that require public permit. The impact assessment procedures are those of Section 102C of the NEPA, with mitigation measures for adverse impacts, and the expected growth inducing impacts included as additional considerations.

State agencies in California provide some additional input to particular planning problems in the form of guidelines. The California Department of Transportation, for example, is in the process of developing an Action Plan to guide the development of highways and other transportation facilities throughout the state. However, most planning and project developments related to this type of plan occur on the regional or local level. The effectiveness of the guidelines for actual implementation will be discussed in the regional and local planning reviews.

Regional Planning

The interdependence of cities for such exercises as environmental planning, land-use planning, and transportation planning has greatly increased the importance of regional planning offices. California is a good example of a state which has delegated almost all of its planning responsibilities to regional or local offices.

The extent of aesthetic considerations at the regional level will be reviewed by analyzing three planning agencies in California--the San Francisco Bay District of the California Department of Transportation, the Metropolitan Transportation Commission of the San Francisco Bay counties, and the Comprehensive Planning Organization of San Diego.

San Francisco Bay District, California Department of Transportation

A preliminary Action Plan has been developed by the State of California to submit to DOT outlining the state's transportation planning process. In it, authority for both major planning decisions and environmental impact assessment lie with the regional transportation districts. Some directions for environmental analysis are given in the State Action Plan. The remaining decisions for analysis are left to the discussion of the regional planners. Regional planners are intended to interact with other interest levels:

> State legislation places major emphasis on planning decisions at the regional level, but also requires that local communities have adequate control over future transportation development in their area. It is necessary that regional plans be based on subregional and community plans and that Statewide plans be based on regional plans (California Department of Transportation, *Action Plan*, 1973).

The Action Plan emphasizes planning procedures, requiring:

> (1) Early identification of economic, social and environmental issues which must be considered in arriving at transportation decisions;
>
> (2) Utilization of a systematic interdisciplinary approach in the identification, analysis and evaluation of issues and problems;
>
> (3) The development of alternative courses of action including different modes of transportation and the no transportation facility alternative;
>
> (4) The involvement of other governmental agencies and the public early in the process and in a manner which will contribute toward effective participation in the process. (*Action Plan*)

In this, the environmental impact assessment process and the project planning process become merged into a single problem-solving approach.

An important phase in decision-making comes with the evaluation of alternatives. These are to be compared in a number of areas, including the project's effects on "man-made and natural resources, esthetic values, community cohesion, and the availability of public facilities and services." Public hearings are required during this phase, "for the purpose of obtaining community expressions regarding the alternatives being considered and to test the corridor study findings in a public forum" (Action Plan).

Each transportation district has an Environmental Analysis Unit and an Environmental Technical Unit. In San Francisco these work together in the Environmental Planning Department, covering the social and economic factors and the physical systems that must now be considered in the project design.

No formal instructions are provided for consideration of aesthetics in project development and environmental assessment. This is left to the planning staff. The Environmental Planning Department employs about eighty of the 2,500 people working in District 4 (the nine Bay Area counties). These include technical specialists in physical systems, experts in environmental analysis from several disciplines, including sociology, landscape architecture, economics and statistics, and associates from widely varied backgrounds who must have the following capabilities:

(1) To interact with the multidisciplinary team

(2) To know, understand and appreciate the project development team (a group separate from the environmental planning team)

(3) To interact with the public

(4) To translate the environmental impact assessment process into a written statement.

Neither associates nor experts are given any written instructions beyond those in the NEPA, the California Environmental Quality Act, and the California Action Plan. Major issues are defined separately for each project, at an initial meeting where the planning program and division of responsibilities are defined.

The environmental evaluation process allows consideration of aesthetics at many points. It is basically the responsibility of the landscape architect in the department to include his input at these points. This is a full-time (but never completed) task, since the District 4 Environmental Planning Office employs only one landscape architect (and the other transportation districts have no landscape architect or equivalent visual design specialist on the in-house staff). The Environmental Planning office considers the EIS as a public disclosure document that will show what a project will do without judging whether it is good or bad. For aesthetics, this means largely a description of the visual effects on roads and views.

Because of the limited staff and the large number of projects to be considered, analytic methods for aesthetics have not been developed or tested in the regional offices. The landscape architect follows a general procedure of identifying important visual points, considering views from (and of) the road, photographing areas of visual impact, and sketching the expected effects of the impact. After these areas have been identified, a time-sequence analysis of the route is used to determine how important the view is to the driver. When a road goes through a populated area, the importance of affected views to the people in the area is considered at public hearings. Public participation is encouraged in evaluating alternatives of visual designs and mitigation measures. The major portion of visual analysis takes place after the route has been selected. Visual criteria generally are not weighted strongly in the route selection. This is due in part to the fact that major transportation corridors are often already established, limiting the amount of choice left to the planner.

Any consideration of aesthetics in the San Francisco Bay Region becomes involved with engineering, political, and economic constraints. Tradeoffs occur in final planning with all of these factors. While the political climate for aesthetics is fairly good in the Bay Area, with a strong movement towards conservation of remaining natural areas, engineering and economic considerations seem to predominate in decision making. Aesthetics is still applied as an afterthought or cosmetic attempt rather than as a serious design consideration.

The need for more complete process of aesthetic evaluation in the District 4 Environmental Planning Department was expressed in a personal interview with the district landscape architect. As an initial step, within the constraints of staff and budget, the department hopes to develop a data base of visual factors to be communicated through photographic and infrared imagery. This would provide material for communicating with groups both within and outside of the Department of Transportation, and perhaps encourage advisory input. Some further interaction with the public may come as a result of anticipated research on proximity impacts of a transportation system on adjacent residents, possibly including some investigation of individual preferences. However, in terms of decisions on design standards, the Environmental Planning Department tends to reserve aesthetic judgment as a responsibility of the design professional rather than the general public.

The Metropolitan Transportation Commission

The Metropolitan Transportation Commission (M.T.C.), as a designated Regional Transportation Planning Agency, has developed a Regional Transportation Plan for the San Francisco Bay Area (M.T.C., June 1, 1973). Its efforts are directed toward the development of a comprehensive plan for transportation in the Bay Area, rather than toward the development of individual projects.

The plan is policy oriented. It outlines the factors that should be considered, but not how they should be measured or what final weight they should be given. The policies are guided by some broad objectives laid out for regional transportation and specific objectives for individual issues. Basically,

> it is the desire of the Commission that transportation planning, policies and decisions that are found to be in conformance with the Regional Transportation Plan minimize disturbance to the natural systems and environment of the Bay Area, and that, to the extent possible, regional transportation systems generate noise, air, water and visual pollution only within those limits indicated by responsible agencies in these fields. ... In developing, maintaining and implementing the Regional Transportation Plan, the Commission will cooperate and work closely with local, state and federal jurisdictions, in order to satisfy the goals of transportation policy at all levels (M.T.C., June 1, 1973).

Transportation development is given broad guidance by the problem oriented policies and objectives. Mass transit as a substitute for widespread use of the automobile is urged in the Bay Area. Aesthetics enters as a factor in several policies:

> Policy 1.20 - "efficient, convenient and economical interface among different transportation modes and safe, comfortable and attractive facilities at principal transfer locations shall be fostered."

Policy 2.5 - "decisions regarding transportation programs shall protect natural resources and environmental and social values of the region."

Policy 3.5 - "facilities for transportation shall not impinge upon irreplaceable resources such as the Bay and its shoreline, important open space lands, recreational areas, historical sites, and prime agricultural areas, unless there are no feasible alternatives which comply with other M.T.C. policies." (M.T.C., June 1973)

No direction is given for public participation specifically within aesthetic concerns, but one specific objective requires that "public participation shall be an integral factor in the preparation, maintenance and employment of the regional transportation plan."

Specific areas for consideration within the region are outlined in terms of corridors. Planning issues for each case are evaluated by a number of factors, including travel demands, land value, and air and noise quality, but visual aesthetics are not considered.

The M.T.C. plan is very limited in the overall considerations that it offers to aesthetics. It is more a statement of purpose than a usable directive. The commission itself represents public officials and agencies. Specialized planning may need to be left to other agencies which have some in-staff design expertise. However, this implies that implementation will rest largely with groups external to M.T.C., who will be able to apply their own interpretations to the broad outlines supplied by the regional plan.

Comprehensive Planning Organization of the San Diego Region

The cities of the San Diego region have recently begun to coordinate efforts on regional planning. The Comprehensive Planning Organization (C.P.O.) was formed as a result of a joint-powers agreement among cities to work towards developing a comprehensive land use and transportation plan for the region in addition to other planning activities of regional importance. The organization is currently evaluating a number of alternatives, prior to writing a final planning draft.

One significant written document available states the goals and objectives for the San Diego Region (Regional Goals Committee, November 1972). These were developed by a committee of over 70 citizens meeting with a number of planning professionals. Citizen participation, on a selective level, is being incorporated into the planning process at the outset.

Five broad areas of goals are outlined, concerning human needs, growth and the economy, the form of the region, environment, and implementation. Aesthetics is stated as a concern related to the form of the region and the general environment through influences of transportation, and open space planning.

Several factors govern growth with respect to physical form--the integration of urban growth with the natural environment, rather than the imposition of development upon it; encouragement of creative design through incentive regulations; enhanced appearance by landscaping all developments; and the preservation of the pattern of distinct, identifiable communities.

The task given transportation is to "maintain, upgrade, or develop existing and future transportation systems as a public service in a manner that renders them safe, feasible, flexible, environmentally acceptable, and aesthetically pleasing." Aesthetic considerations in this area are concerned with the planning and design of the natural terrain and of the community.

Open space is an effective element of form of the region. It includes some aesthetic aspects in terms of providing community amenities and preserving areas of significant natural beauty.

Goals for the environment extend aesthetic concern to the broad areas of conservation and enhancement. Guidance of aesthetic concerns appears both in the protection of wildlife and vegetation for its own beauty, as well as for its other benefits to man and the elimination or regulation of "signs, billboards, wires, antennas, buildings, and land uses that detract from the attractive topography and physical setting of the San Diego region."

The C.P.O. staff is beginning to prepare regional plans which incorporate the objectives stated by the goals committee into several alternative growth policies. Some background material was gathered by the C.P.O. staff in January 1972 on environmental quality and natural resources in the San Diego region. This included some user preference surveys related to aesthetics, specifically in terms of visual pollution.

Respondents were asked if they noticed visual pollution, and if so, in what form. This brought out a list of noticeable elements, including litter and trash, run-down buildings, signs and billboards, junkyards, smog and haze, telephone equipment, abandoned cars, and ocean and beach contamination. From this list, some aspects of visual quality are determined.

Standards might be developed from this research, but nothing of this type has been applied to the preliminary regional plans. The only plan where visual elements appear substantially is the Initial Coastline Study and Plan. Vistas have been mapped and incorporated as an important coastline feature in development consideration. However, in this case, vistas have been identified by professionals from surveys of highway routes. Elements important to residents have not been considered. The Preliminary Open Space Element might be another place for consideration of aesthetics, but at the moment, decisions are based on other criteria--recreational needs, conservation, and guiding the location and timing of urban development.

C.P.O. acts only on an advisory level. The staff may review proposals and environmental impact reports, but it does not prepare any. Its main review strength lies in projects involving federal funding and in the allocation of gas tax money for transportation services. In all other cases, decisions rest with the individual city and county governments. While some of these do consider aesthetics in their planning processes, no county-wide standards have been developed for considering aesthetics.

Aesthetics at the regional level of planning in San Diego is at the mercy of a currently fragmented system of planning. Each stage of the planning process, from goals through implementation, is governed by a different planning body.

No authorized criteria exist as a framework to clarify and compare decisions at each level. The current political climate in the region has worked against any institutionalization of aesthetic values into land use. Land speculation and development interests put strong pressure against any move towards preservation or limits of land use. Yet other citizens in the region are beginning to express an interest in controlling and directing growth, towards protecting current amenities in the area. If these interests are to be considered along with economic interests, some further evaluative work is needed to identify aesthetic values and means for their enhancement.

City Planning

Aesthetic considerations take on new dimensions at the city level. While Federal, state and even regional agencies are often limited, by choice or legislation, to policy formulations presented in general guidelines and directives, city planning agencies are directly responsible for guiding physical appearance. Through zoning ordinances and building codes, a city becomes involved with design problems ranging from the skylines image at a distance to small-scale visual details.

The aesthetic problems that arise in a city are similar to those that developed in the traditional sphere of art and culture. Aesthetics is often a product of individual taste. Man's relationship with his past endeavors and his natural surroundings is approached in a peopled setting, where any creative efforts face approval or disapproval by the city inhabitants.

American city planning began as a physical design effort. Therefore, an awareness of visual aspects has been present in the planning process of cities well before the NEPA. The standards and guiding principles for design developed by a city over the years are now applied in the NEPA context of environmental impact evaluation. These standards and principles in many cases are the basis for establishing visual quality criteria in project evaluation.

The California Environmental Quality Act of 1970 requires local agency involvement in environmental impact report procedures. Section 21151 of the Act states that "All local agencies shall prepare, or cause to be prepared by contract, and certify the completion of an environmental impact report on any project they intend to carry out or approve which may have a significant effect on the environment." Furthermore, Section 21082 requests that "all public agencies shall adopt by ordinance, resolution, rule or regulation, objectives, criteria and procedures for the evaluation of projects and the preparation of environmental impact reports."

As a result of this legislation, and also citizen concern for the visual quality of their surroundings, California cities have begun to incorporate environmental analysis into their planning procedures. The results of the incorporation in each city are influenced by the planning considerations that are already established. Aesthetics in San Francisco and San Diego, as two examples, may receive very different treatment because of the difference in planning guidelines.

San Francisco

In response to requirements in the California Environmental Quality Act (CEQA) San Francisco has drafted an amendment to the San Francisco Administrative Code, Chapter 31, on Environmental Quality (February 22, 1973). This chapter directs environmental impact considerations, with the stipulation that "To the extent feasible, the Department of City Planning shall combine the evaluation of projects, preparation of environmental impact reports and conduct of hearings with other planning processes, and shall coordinate environmental review with the capital improvement program, the Master Plan and the City Planning Code." The environmental impact report serves as an addition to the planning process, not a separate procedure. It is "an informational document providing a detailed statement of environmental effects and considerations for use by public decision-makers in considering a project. Such a report also informs the general public, and provides an opportunity for public participation and for comments by other interested public agencies."

The aesthetic considerations of the environmental assessment procedure can be expected to be those outlined in the Master Plan. These are specified as items of the Urban Design Plan, an element of the San Francisco's Master Plan, written in 1971. The development and implementation of this plan define the role of aesthetics in guiding the San Francisco environment.

The approach to urban design problems in the city required definitions of goals and objectives. These were obtained through contact with citizens. Professional consultants conducted neighborhood interviews, park user surveys and a street livability survey to determine the issues of greatest importance to the citizens. The identified issues were modified by questionnaires and public hearings as well as by the consultants' own interpretation of the responses. The issues found to be important were then used as the basis for the study.

Aesthetics is a central problem in the Urban Design Plan. While specific issues concerning citizens centered around factors of safety, comfort and recreation, judgments of the physical manifestations of these items focused on measuring quality:

> Urban design planning is a response to human needs. It is part of the process of defining quality in the environment, and quality is based upon human needs. Quality means degree of excellence, and when applied to cities it depends upon pleasing physical relationships, a fitting together with

> scale and interest and without jarring contrasts. Over time, quality means cultural heritage, and things and values that last. For the city's residents it means a good life, and the ability to take for granted a certain measure of security, health, comfort, enjoyment and convenience, and freedom from over-congestion and pollution. Quality in life must also include a chance for privacy, for interesting activity and for achievement.
>
> (San Francisco Department of City Planning, 1971)

The purpose of the Urban Design Plan was to define this quality, as a usable framework for guiding the future development of the city.

The plan goes beyond the environmental assessment procedures of the NEPA and the CEQA by providing definite judgments on good and bad design.

> If a plan for urban design is to define quality, it must determine what exists that is good, what needs to be improved, and in what respects the changes should be made. Once agreed upon, through adoption of the plan, such a definition of quality will be a basis for protection and enhancement of the environment, provided there is sufficient public will to see that the plan is carried out.
>
> ***
>
> In The Urban Design Plan that follows the four categories of concern, City Pattern, Conservation, Major New Development and Neighborhood Environment, are each covered in turn. In each case, human needs are identified and an overall objective relative to those needs is stated. Then fundamental principles concerning important urban design relationships are described, and policies are established as a guide for public and private actions toward realization of the overall objective.
>
> (San Francisco Department of City Planning, 1971)

Design elements are described in detail in the plan, and their implications for good or bad visual effects are described in detail within each category of concern. City pattern is strongly visual, defined by major views, topography, street pattern, buildings, landscaping, open space, and street features--basically elements of man's modern influence on the city. Conservation deals with elements to be preserved--natural areas, landmarks of historic, architectural or aesthetic value, the visual character of an area, and spaces in the building pattern that provide light and air. Elements directing major new development provide mainly for the promotion of harmony in visual relationships and transitions between new and old buildings. Neighborhood environment is most concerned with safety features, but also emphasizes the visual elements of the first three categories in terms of human scale and interest.

Guidelines for the application of these elements, in the form of policy statements, vary from broad, general statements to very specific standards. Detailed height and bulk limits are outlined for the entire city; strict standards for street vacation permits (permits to build into a street area) virtually eliminate future street vacations (which usurp space, light and air); recommendations and sketches describe the visual variety that may come from street furniture designs. On a broader scale, recommendations include the avoidance of extreme contrasts in color, shape and other characteristics which will cause new buildings to stand out in excess of their public importance, promotion of large-scale landscaping and open space that define districts and topography, the removal of obscure distracting and cluttering elements, and many others.

The overall strength of the design standard varies with the implementation methods. Some now exist in the form of legal ordinances, while others remain as policy measures.

Two ordinances having definite effects on the visual character of the city have been enacted since the Urban Design Plan, largely for aesthetic purposes. First, height and bulk standards have been issued over the entire city. These come in part from the design needs of city pattern as analyzed by professional consultants and in part from expressed interests in neighborhood preservation. Thus one major design recommendation--that "Clustering of larger, taller buildings at important activity centers (such as major transit stations) can visually express the functional importance of these centers"--gave way to the protests of neighborhood groups. The current height and bulk limits tend to represent the aesthetic values of the citizens of San Francisco (brought out in public hearings) as well as of a professional design staff.

A second ordinance, an amendment to the planning code, regulates building projections over streets and alleys, almost entirely on aesthetic grounds, with direct reference to the Urban Design Plan. Street projections are permitted only if they provide certain benefits, one of which is greater visual variety and development of building facades to a more human scale.

These are definitive legal steps toward providing "the small-scale visual qualities that make the city a comfortable and often exciting place in which to live."

Where the plan does not serve as a background for legal measures, it acts as a communication device similar to San Francisco's version of environmental impact reports:

> Ultimately, the Plan can be described as a form of communication, a common language, or a system of reference points that will enlist community agreement. Most simply put, it is a definition of quality in the San Francisco environment.
> (San Francisco Department of City Planning, 1971)

Through an integration of environmental concerns and traditional planning techniques, the San Francisco Department of City Planning has succeeded in incorporating a large number of aesthetic factors into its planning process. The Urban Design Plan gives a broad foundation from which further analytical techniques may develop. At the moment, many final judgments rest on a combination of subjective advice from planning officials and free decisions by developers. The planning department (like the National Park Service, at a different level) is attempting to balance a need for definite aesthetic standards with an atmosphere of freedom of creativity.

> Urban design planning does not seek rigid order in the city; rather, it seeks balance and compatibility. Therefore, design implementation is directed not toward sameness and sterility, but toward complementary patterns in which diversity, variety and even randomness may be welcomed. This means that all feasible latitude should be given to the design professionals for individual projects, within the context of overall design planning. To the extent possible, each case should be considered on its own merits.
> (San Francisco Department of City Planning, October 1970)

The City of San Diego

The City of San Diego has begun to consider aesthetic design issues, though not to the same degree of detail as San Francisco. San Diego's general plan is being rewritten, but is not yet completed. The plan is based on eight issues that have been identified for the city--industry, housing, commerce, parks and recreation, transportation, conservation, open space, and public services and facilities. None of these factors are directly aesthetic, though some might include visual elements.

Some portions of the zoning ordinance relate to aesthetic problems, though generally as a small factor among several issues. One example is the land conservation zone, which applies to all areas of 25% slope or greater. In these areas, certain standards must be met in development, including the minimization of land form change (an effort to preserve the physical attractiveness of the community).

The city's Environmental Quality Department has developed an environmental review process in accordance with the California Environmental Quality Act. Aesthetic concerns are mentioned in the relevant ordinances (Nos. 10952 and 10961) at a very general level. They gain further consideration through the department's "Guidelines for Implementation of California Environmental Quality Act and for Processing Environmental Impact Reports and Negative Declarations."

Under the ordinances, significant effects can include irrevocable harm to the aesthetic amenities of an area or resource, or disruption or alteration of the appearance or surroundings of a historical or archeological site. Moreover, an environmental assessment form is required listing expected effects by categories, including the extent of alteration to unique, natural features and the effects of construction on views.

According to the guidelines for implementing the legal requirements, an environmental impact analysis is required on "Any project which will adversely affect a natural, historical, or aesthetic resource" (San Diego Environmental Quality Department, March 1973). The description of environmental impact is to include scenic quality. Furthermore, in considering adverse, unavoidable impacts, the decision maker is instructed, "Do not neglect impacts on any aesthetically valuable surroundings or on human health."

An Environmental Assessment Form is filed for a project before the decision is made as to whether to require an Environmental Impact Report or a Negative Declaration. Several of the assessment areas within this form definitely consider aesthetic problems. The assessment must include a physical description of the lot and plans, with drawings. Objects of historical, aesthetic or archaeological significance must be identified. Finally, visual impacts are considered in several ways: (1) the project's effect on scenic views that may be enjoyed by passers-by, nearby residents, or employees of nearby establishments, (2) the contributions the project will make to visual aesthetics, and (3) how the design of the project (architectural and landscaping) is coordinated with the design of the existing community.

The results that can be expected from these requirements are now limited by the areas of application of the environmental review process. Development permits are affected more than the general planning process. Currently, if the project is within the existing ordinances (zoning and building codes), no environmental impact report is needed, no matter how "significant" the project is.

There are no standard criteria that may be used by the city in judging aesthetic values. Attempts by city staff to draft an ordinance controlling scenic quality have been unsuccessful, because of the subjective nature of the evaluation involved.

Citizens participate in city planning to some degree through citizen advisory groups from each community. These groups draft community plans, which are considered in writing the city's general plan. Many of these plans include aesthetic issues, such as height limitations, though these are not required considerations.

Citizens may comment in the environmental assessment process as well, at Environmental Impact Report hearings. As in community planning, this is only an advisory role, and will not necessarily be effective.

As in the Greater San Diego Region, the City of San Diego faces strong political and economic pressures which work against immediate attempts at aesthetic protection. The city may need stronger guidelines and processes if visual controls are to be successful.

Planning in the Private Sector

The Pacific Gas & Electric Company

Government agencies control much of the large scale development throughout the country. However, a large amount of detailed planning is carried out by the private sector. Utility companies, for example, play a major role in planning as their facilities and services usually extend over a large territory.

The Pacific Gas & Electric Company (PG&E) in California is a utility company and as such it owns, maintains, and operates transmission lines, substations, and other facilities. In planning such facilities, the approach adopted by PG&E in the environmental and aesthetic sphere is to attempt to minimize environmental and visual effects.

PG&E services extend to both urban and nonurban areas, each posing significantly different planning issues. Densely populated areas are avoided whenever possible; however, when it is necessary to traverse such areas, transmission structures which harmonize with the surrounding environment are considered. The overall architectural treatment for substations and other facilities depends upon the surrounding terrain, the use of compatible materials, and the architectural style prevailing in the area in order that the facility be integrated with its surrounding environment.

In rural areas, the visual effect created by transmission lines is in general more varied. In relatively undeveloped and open areas, the visual effect created by these lines is dependent upon (1) the method of treatment employed, (2) who is affected, and (3) what is seen.

The procedural steps in the transmission line planning process can be outlined as follows:

(1) Definition of need for energy in an area. This involves a system planning decision and population and consumption projections.

(2) Identification of the power source. The source may either be from the PG&E system or power purchased from some other system.

(3) Regional analysis, to determine a path for the power from source to termini.

(4) Detailed corridor analysis.

Regional analysis includes some aesthetic considerations along with many others. The staff defines a study area for possible routes in terms of land use, population, economics of the region, the existing infrastructure, natural elements in the environment, historical and archaeological sites, recreation, and scenic values. A detailed inventory of these factors is compiled and maps of the area are produced. For major projects computer techniques are utilized. "Planning value" maps which depict sensitivities are then computed for each of the environmental elements and a final "suitability map," which is a composite of all factors, may be synthesized. These sets of data are utilized in generating feasible alternatives for transmission line corridors which minimize environmental effects consistent with engineering, economic, construction, and operation requirements.

Detailed visual analysis takes place after the alternatives have been defined, as a part of the investigation process required in comparing alternatives. An analytical model for visual analysis is currently being developed in a cooperative effort within the Company by the departments of Land, Architecture, Environmental Quality, and Transmission Engineering. The procedure is outlined in a short report on visual analysis (S. R. Kaderali, 1972):

The main components in a visual impact analysis are: What is seen? How easily is it seen? How much can be seen? By whom and how many is it seen?

These questions can be investigated by determining:

(1) Whether the view is clear or obstructed (topography, vegetation).

(2) The position of viewing (elevation).

(3) The distance of the viewer from the subject (the range of viewing).

(4) Whether the viewer is standing still or moving (land use).

(5) The attractiveness of the subject.

(6) The viewer's concentration on the view.

(7) The time of day.

(8) Weather conditions.

(9) The number of persons viewing the subject (activity, population).

In order to evaluate the visual impact, it is necessary to determine which areas are seen by a large number of viewers, the land use or activity of the identified areas, and the degree of attractiveness of the area.

The information gleaned as answers to these questions can be weighted to some degree by a visual integration matrix, which considers the visual absorption capacity of a landscape. Broad definitions are rated from low absorption capacity to high:

(1) Flat topography [low]
No vegetation

(2) Rolling topography
No vegetation

(3) Flat topography
Light vegetation

(4) Rolling topography
Light vegetation

(5) Closed topography
No vegetation

(6) Closed topography
Light vegetation

(7) Flat topography
Heavy vegetation

(8) Rolling topography
Heavy vegetation

(9) Mixed development
Light vegetation

(10) Mixed development
Heavy vegetation

(11) Closed topography [high]

This has been adapted from a photographic matrix of development in landscape by Jacobs and Way, in "A Systems Analysis Model of Urbanization and Change," Steinitz and Rogers, MIT Report #20, 1970.

The depth of visual analysis required depends upon the length and location of the transmission line being considered. For a short line, the most important effects are those on the resident community. Factors usually considered are the areas from which the line can be seen, the number of people exposed, and the overall integration level of the line.

With the longer line, the view of the line is usually considered from population centers, major roads, activity centers, and points of high and low elevation. To scan for visibility, the analyst visits all areas of high elevation that are accessible to the public. The use of video techniques to document visual data are being developed, and in the future much of the visual data may be recorded by video tape for analysis and reference purposes.

A new process is being investigated to estimate the possible visual effects of a transmission line on a regional scale. Computer techniques for scanning data are being considered as a process of defining avenues of vision. The comparison of alternative corridors involves the consideration of various factors, including environmental, visual, engineering, economic, construction, and maintenance criteria. All city, county, state, and Federal agencies with interest in a study area are notified at the initiation of the project and they are consulted to assist PG&E in determining the most compatible route. City and county planning commissions, for example, often become involved in evaluating proposed transmission lines.

Public information meetings usually occur in the later planning stages and special meetings with interest groups are arranged as appropriate or by request. Constructive comments and suggestions from concerned individuals have been difficult to obtain in the past, but the Company is investigating formal methods for public participation.

PG&E, as a private company, has financial and professional leeway, not always available to government agencies, that encourages experimental approaches. Techniques developed and put to use in the company might be considered as well by public agencies for possible future use.

The Private Consultant

If experimentation is apparent in private companies, it is even more present among private consultant firms. Much of the work done by consultants is for public agencies which lack the manpower or other resources to conduct a complete planning job on their own. Consideration of aesthetics often increases with the amount of time allotted to the job. The work of Kevin Lynch and Sasaki, Dawson & Demay Associates, Inc., for the Vineyard Open Land Foundation, is an example of an approach to aesthetics separate from guidelines and weighted criteria (Lynch et al., 1973).

"Looking at the Vineyard" is a visual study of Martha's Vineyard. The study was funded in an effort to "promote the preservation of the natural beauty and rural character of the Island of Martha's Vineyard." The consultants provided a highly subjective and professional analysis of the island's features, while at the same time probably coming close to defining the most important aspects of the island for the people who wish to see it preserved.

Completely free from superimposed guidelines and requirements, the consultants were able to attack the problem of the "character" of a place. This began with two separate inventories on the island. One consisted of defining the major physical features (land forms and vegetation) that work toward producing the total island landscape. The other attempted to discover the island features most important to the users.

The island user study was limited by time and money. For the most part, "for the lack of more thorough survey of this kind, this report has necessarily been based on the analysis of the island as seen by the survey team. An adequate analysis of the image of the Vineyard, as held by those who use and know and love it, remains to be done." However, some recognition of frequented places and valuable features did emerge from the survey. This type of study rarely appears in government analytic methods, even as a very limited survey. Yet the inhabitant of a place is probably the person best capable of describing its essential character.

The land form-vegetation inventory of the island served the purpose of providing a comprehensive portrait of the appearance of the island. Eight types of landscape are identified--salt lands, bluffs, moors, hilly thickets, wooded moraine, open plains, flat thickets and wooded plains. These are described verbally and by interpretative sketches.

In the "planning" portion of the document that follows, guidelines and controls are suggested for the future development and use of each area. These are developed by the consultant designers, without outside input, mainly in terms of how much growth each area can be expected to absorb without suffering changes in character.

In this private study, future growth is determined by the visual framework present. While the consultants recognize that other factors affect development as well, there is no doubt that visual quality is retained as an important element from the beginning of the planning process. The document produced in this case is not decisive, in that the consultants have no power for implementing their standards. Yet consultant work can be extremely valuable in providing new perspectives for viewing a plan.

Some concentration on the uniqueness of each area is necessary as well as the use of universal quality standards, for much of the field of aesthetics is based on diversity. This type of concern has little opportunity of appearing in public agencies, though some have begun work in this direction.

Summary

The review of a few representative planning agencies demonstrates the wide range of responsibility assumed for aesthetics in environmental planning at various levels of planning activity. Though responsibilities are rarely clearly defined, it appears that Federal, state, regional, city and private agencies have begun to map out general areas of concern for aesthetics within their planning procedures. It seems relatively clear from the preceding review of agency involvement that a number of generalized conclusions can be made about the state of the art of aesthetics in the planning process. These are:

(1) Many of the agencies reviewed, i.e., Federal Highway Administration, Park Services, U.S. Forest Service, have been concerned with the subject of aesthetics since long before the NEPA. The basic philosophical approaches that have developed over time demonstrate the diverse direction that each agency is taking. For instance, the primary objective of the Federal Highway Administration has centered around developing natural resources for the purpose of providing a pleasurable experience for highway users. Thus, highway beautification and aesthetics in general reflect an attitude of development, with considerable attention given to cost/benefit analysis and the idea of minimizing, wherever possible, visual impacts to the surrounding environment. This often means trying to camouflage the project (i.e., the "cosmetic attempt") or attempting to design visually attractive facilities (e.g., retaining wall, clover leaf), nonetheless supporting the philosophy that man's desires come first. The research funded by the highway administration, i.e., methodologies by Steinitz, Hornbeck, University of Wisconsin-REMAP, further support this assumption by the very way they characterize aesthetic factors and establish criteria for evaluation of this importance. Aesthetic factors are identified by their usefulness to the driver and evaluated by their cost to the developer.

The National Park Service and (to some extent) the U.S. Forest Service appear to be more conservation oriented, attempting to subjugate man's activities to nature. Though the Park Service recently adopted a philosophy of "bold" design, their basic aesthetic consciousness is reflected in their preservation of natural resources rather than development of them. Still, man's enjoyment is of primary concern. The Forest Service emphasizes the subordination of man's desires to the goal of conserving natural resources. Any activities planned or reviewed by the Forest Service must be responsive to the guidelines firmly established for visual analysis of proposed projects. This often results in costly, time consuming efforts on the part of the planner, and in some cases, a total re-evaluation of the need for the activity in general (an example of this is cited in the Appendix).

The significance of this discussion lies in the fact that there appears to be little, if any, attempt by any Federal agency for establishing aesthetic criteria at the national scale for resource development. The problem becomes acute when more than one agency is involved in development in a single area. Often either philosophical approach could apply, but the coordination of two different sets of values is difficult.

(2) Another point illustrated in the planning review is the lack of any clearly defined aesthetic responsibility at different levels of planning activity. There seems to be no indication of exactly who or what is involved in aesthetics in environmental planning. The rather vague generalized statements in Federal and state guidelines as to the disciplines included under "design arts" (they could be anyone from engineers to potters) and the area of aesthetic concern (i.e., what constitute aesthetic resources, natural amenities, historical and unique areas) offers little guidance to responding planning agencies. Additionally, the lack of any established social policy for aesthetics leaves it open for agency interpretation. As it stands, aesthetic quality is often determined by an elite few with very little public participation or public feedback in the design process. The tools that are used by planning agencies for obtaining public opinion on proposed activities are, at best, in their infancy, yet, the Federal Highway Administration seems to be the only agency seriously attempting to develop this aspect of planning (i.e., Manheim's work).

The responsibilities for aesthetic or visual quality have sifted down to the city and private planners, placing a tremendous responsibility on this level of concern for protecting the aesthetic resources of an entire nation. Other than a few very specific acts (i.e., the Scenic Rivers Act, the Wilderness Act, Highway Beautification Act, the NEPA), there are no controls for preserving aesthetic quality in this country. The private sector and city planning agencies, however, are beginning to assume their responsibility for aesthetics by investing both time and money in establishing objectives for development and outlining appropriate aesthetic criteria. The problems encountered with this approach are reflected in the fact that these agencies have a limited scope of control (i.e., zoning, ordinances, building codes) and are often dependent on the function of other planning activities. The need for coordinated planning is especially strong at the regional level, where activities (i.e., transportation) cross many geographic boundaries. At the moment, this is one scale of planning that has uncertain impacts, as implementation powers lie at other government levels.

(3) The third and final point to make about aesthetics in planning is that there was very little indication among the agencies reviewed that any of the aesthetic assessment methodologies are actually being used. Most planners interviewed for this study either had never heard of the methods available or found them useless for their work (i.e., a typical complaint was that they were too subjective, too time-consuming in data collection, not flexible enough for diverse planning situations, and too expensive). Only the private sector of planning seemed to consider aesthetics important enough to spend the staff time and money to develop extensive assessment tools (i.e., PG&E) and seriously weigh aesthetic impacts in project evaluation. Perhaps public pressure on the public image has initiated this concern, but regardless, many lessons can be learned from attempts that have been made recently by private corporations in the area of aesthetics in environmental planning.

VII WHERE WE NEED TO GO FROM HERE

We are only beginning to understand the importance of the quality of our perceived environment. A recent survey (Euston, 1971) shows that the Federal commitment to man-environment research has grown considerably in the past few years. However, much more is needed. All indications point to the conclusion that research in the area of aesthetics is proportionately less than other areas of environmental concern (e.g. air quality, land use planning, water quality) and yet, aesthetics is the one that is most closely tied to the appreciation and acceptance of a project. The need for variety, diversity, and freedom of individual choice is important to the American way of life. But a growing population with diverse interests and needs places unusually heavy demands on a world of limited resources. In order to protect the aesthetic rights of both present and future generations we need to formulate a social policy for environmental aesthetics and define our goals.

The need for some nationally recognized criteria for aesthetic considerations is apparent, particularly at the Federal agency level. Since basic aesthetic philosophies differ among single-purpose planning agencies comprehensive planning for large geographic areas is extremely difficult, if not impossible. The following outline delineates suggested areas for future research based on the material in this paper defining "where we're at"--we now need to define "where we need to go from here."

An Improved Understanding of Aesthetics for Environmental Quality

The following research projects are suggested:

(1) At the micro-scale, research for defining man's aesthetic needs in his socio-physical environment:

- Physiological needs--Establish human tolerance levels as stimuli are perceived through the senses. Relate these to air quality, noise, odor and other environmental factors. How do these affect man's ability for aesthetic experiences? Also, research to understand man's genetic tie to the natural environment, and how man's physiology may change due to a lack of exposure to the natural element.

Preceding page blank

- Socio-physchological needs--Define man's need for space, nature, variety, safety, tranquility, expression, belongingness and so on. Relate to aesthetic conditions of environment. How are attitudes and values identified?

(2) At the macro-scale, research to define societal needs and influence of these on aesthetics:

- Economic--The effects of capitalism on man's activities, i.e., leisure, recreation, work, consumerism, artists' creativity.

- Political--Social policy of agencies predictive interactive or reactive. Special emphasis on environmental policy and laws.

- Environmental (physical)--Implications of limited resources, land use, and urban development.

Research for Applied Theory

The following research projects are suggested:

(1) Develop criteria for evaluating methodologies designed to assess aesthetic impacts--special emphasis on objectivity, secondary impacts, and aesthetics as an interrelated aspect of all environmental elements. Also should include aesthetics as perceived by all senses, not just visual.

(2) Increased emphasis on user preference studies for understanding individual attitudes and group values about aesthetic characteristics in the environment.

(3) Develop aesthetic quality indicators for different levels of concern (national, state-regional, community-local) and devise monitoring techniques.

(4) Develop tools for communicating aesthetic effects of changes resulting from planned activities--simulation labs for visual and auditory impacts.

(5) Develop an information system for source material on aesthetic research.

Research Directed Toward Improving Aesthetic Considerations in the Planning Process

Research aimed at defining the responsibilities for ensuring aesthetic quality at the major levels of planning:

(1) At the Federal level

- Guidelines of Federal agencies for aesthetics must be more explicit and should be consistent with other agency guidelines.
  - identify staff members termed 'design arts'
  - expand scope of concern to include secondary impacts

- Initiate cooperative research in aesthetics with other Federal agencies, particularly pertaining to research for improving an understanding of aesthetics.

- Define levels of aesthetic freedom and develop appropriate standards to protect these.

(2) At the state and regional level

- Provide guidance to local areas by developing aesthetic goals and criteria in comprehensive planning guidelines.

- Analyze available data sources.

(3) At the local level

- Develop guidelines for ensuring interactive social policy for planning.

- Analyze controls available to local government for ensuring aesthetic quality and protecting aesthetic freedom.

Appendix

EXAMPLES OF WORK DONE BY FEDERAL AGENCIES THAT INCORPORATE ATTENTION TO AESTHETIC IMPACTS

Preceding page blank

Appendix

EXAMPLES OF WORK DONE BY FEDERAL AGENCIES THAT INCORPORATE ATTENTION TO AESTHETIC IMPACTS

Department of Transportation

The Department of Transportation has prepared a memorandum on a proposed Environmental Impact Statement and has put out two publications, one on park and recreation facilities and the other on highway joint development and multiple use, that show DOT recognition of aesthetic principles and attention to aesthetic impacts.

DOT Memorandum TES-70

A DOT memorandum (TES-70) on March 12, 1973 reviewed the Environmental Impact Statement proposed for the Glenwood Canyon/Cottonwood Pass project in Colorado. Criticism of the EIS centered around the failure to consider location and design in a single multidisciplinary setting.

> We commend the commitment of the Colorado Department of Highways and FHWA to a goal of minimizing harm in the Canyon through the use of a design concept team of recognized experts in engineering, architecture and environmental design. However, after a careful review of the relevant documents as well as comments from other agencies and the general public, we do not believe that the location and design decisions can be separated in this case, because how the highway is to be designed is as important as which corridor is selected. Moreover, it is uncertain whether a satisfactory design can be developed in Glenwood Canyon that preserves the existing environmental values. Accordingly, we cannot recommend approval of a Section 4(f) determination/final environmental impact statement of a Glenwood Canyon location for the route until a more detailed comparison of design alternatives is made for the two principal alternatives (Davis, 1973).

The reconsideration of alternatives is directed towards consideration of the effect of placing Interstate I-70 in Cottonwood Pass or Glenwood Canyon on the multiple use of the highway corridor for transportation and recreation; access to recreation and to particularly scenic areas without

Preceding page blank

derogating from the quality of these areas; natural terrain and undulations, vistas and special landscape features; housing patterns and availability; businesses and commercial development; architectural quality; historic sites; noise; rivers and streams; wildlife migration in the area; erosion; and traffic, including origins and destinations served by the highway.

At least half of these have direct aesthetic impact. This list incorporates some purely visual values into the planning requirements, in the form of maintaining the quality of scenic areas, vistas and special landscape features. Other requirements involve maintenance of visual quality as one purpose among several, particularly with architectural quality, historical sites, and rivers and streams.

The NEPA requirements for interdepartmental involvement in decision making are upheld by the suggested review procedures for this EIS. A review board is recommended, to include representation from the Colorado Highway Department, the Glenwood Canyon Advisory Committee, established by the Colorado General Assembly, the Colorado Land Use Commission, representatives of four affected counties, the U.S. Forest Service, the Bureau of Outdoor Recreation, the U.S. Bureau of Land Management, the Federal Highway Administration, the Office of the Assistant Secretary for Environment, Safety, and Consumer Affairs in the U.S. Department of Transportation, and the Council on Environmental Quality. The board would determine design and location alternatives, as well as advising on the final decision.

This is one example of the use of environmental impact procedures to encourage design evaluation in the main stream of plan formulation. Methodology for assessing impact, however, is left entirely to the Colorado Division of Highways planners and the review board.

DOT Report

Interdepartmental work is encouraged in a DOT publication on "Park and Recreational Facilities," of March 1971, discussing the consideration of parks "as an environmental factor influencing the location and design of a highway." The work develops a framework for the consideration of conflicts between highway and park locations. It is an attempt to point out the necessary areas of knowledge for decision making. The decision process divides into several areas--data acquisition, highway impact areas, park classifications, and suggested design criteria.

The procedure for data acquisition recommended is the use of the Bureau of Outdoor Recreation Inventory Forms. These describe each park in terms of acreage, types of use (recreational, activities, and others), facilities, special problems, and features of the land. The importance of determining the "before" value of the land is emphasized as a precedent to evaluating the highway impact.

Highway impact evaluation is to be made by both highway and park personnel, and unspecified "other interests"--an opening for other public agencies or private individuals, but with no minimal input standards required. The impact zone to be considered has two aspects:

(1) The distance on either side of a roadway when the noise, sight, and smell of traffic, and traffic as a physical barrier are detrimental to adjacent park uses.

(2) The distance on either side of a roadway that is necessary to solve the detrimental impact (Isaacson and Peterson, 1971).

The degree of impact and possible solutions are considered in these terms. Other effects such as increases in park use, or a change in park uses induced by highway development are not considered.

The position is taken that the importance of an impact varies with the type of park. Parks are divided into six types, by size and use: mini-parks, playgrounds, neighborhood parks, miscellaneous active recreation areas, large parks, and parkways. The impact criteria depend upon the park use. Aesthetic criteria appear for only half of the park types. Mini-parks, playgrounds and active recreation areas are judged entirely by how the presence of the highway will affect the utilitarian values of the park, without considering aesthetics or visual quality as a part of park use.

Aesthetics seems to get more consideration in the larger parks. For neighborhood parks, noise, air and visual pollution are criteria as well as effects on natural park edges and screening. Some physical design and planting recommendations are made in this area for reducing impacts. The visual effect is considered important in this case as the park may be a city's only contact with nature. Definite encroachment limitations are outlined for large parks, which may contain unique natural areas or primitive areas that should be preserved purely for their aesthetic values. Finally, parkways exist in part for their aesthetic value of displaying the natural environment, and as such follow parkway design standards. Aesthetics appears to have very specific, limited areas of application to highway planning in this report. The only aesthetic standards that appear are those connected with the natural environment. Beauty in the manmade environment is not considered. Furthermore, aesthetics is left entirely out of the utilitarian parks, yet it must be a factor of park use there as well.

In another report, highway development is discussed in terms of joint development in the right of way. Specific projects are at the discretion of the State Highway Departments. However, the U.S. Department of Transportation has put out a publication on the subject in conjunction with several other agencies, covering "Highway Joint Development and Multiple Use" (February 1970), with the purpose of encouraging State Highway Departments to continue planning in this area.

The report is directed towards several ends:

(1) Presentation to the highway building organizations--examples of what their sister organizations have accomplished.

(2) Presentation to the public sector--efforts currently underway either by or through the State highway organizations.

(3) Presentation to the private sector--the possibilities that may exist for development and growth (compatible and coordinated) in conjunction with a highway project.

(4) Presentation to the general public--efforts being taken in the highway development process to integrate a highway facility with the environment through which it passes.

(5) Presentation to the educational institutions--the current status of effort as it serves as input to the growing number of individual and group research studies in this subject area. (p. 2)

As such, it is an example of a versatile communication tool. The value of joint development projects is described briefly in words, and then through pictorial examples:

> Highway joint development projects have been carried out for a multitude of purposes, but basically the objective sought has been a higher measure of compatibility between the highway facility and its environment. This attainment may be measured in terms of savings and replacements as to land, money, public facilities, time, land uses or in terms of area improvements to be made at the opportune time of highway construction. (p. 2)

This type of highway development is almost entirely for practical purposes. Even where some aesthetic considerations are mentioned, as with Route 280 in California, it is "envisioned as a highway corridor of utilitarian beauty, and was planned to recognize, respect and enhance the natural and manmade beauty of the San Francisco 'Peninsula,'" (p. 8). Serving an educational or recreational purpose, however, other planning procedures encouraged may allow further aesthetic considerations, as the joint planning policy recommendations do recognize that "The joint development reconaissance work should be done cooperatively with local governments and other recognized planning resource organizations and groups representing the people of the affected areas" (p. 116). Each area may then incorporate its own aesthetic values.

U.S. Forest Service

Some effects of the U.S. Forest Service concern with design criteria can be seen in actual results of interdisciplinary planning. Two cases are discussed below, which show contrasting applications of design standards.

Case 1

Planning considerations for winter sports resort development are developed by the U.S. Forest Service and the National Ski Areas Association in the form of a policy statement. The majority of planning considerations are based on the value of the area to the skier, and how his needs can be met. Some visual considerations are included as additional factors:

> Skiing is but one of many recreation uses of the National Forests. Although it is one of the fastest growing sports in the nation, it represents only a small portion of the total recreation use. The public has become more aware of and concerned about the environment and the developments on and adjacent to the public lands.
>
> Many of the potential winter resort areas are readily visible from major highways and from other heavily used recreation areas. The amount of landscape modification permitted will vary greatly with slope, aspect, vegetation color and texture, type of terrain and distance from the viewer.
>
> A variety of methods to lessen impacts should be considered in planning. Runs can be shaped and natural openings used to minimize straight line effect. Feathering and scalloping of trail edges, thinning or glading of timber, creating natural appearing openings, are effective methods. Lift lines can be blended into ski runs, topography and natural openings. Roads can be minimized, eliminated, or designed and screened in a manner that will not detract from the esthetics.

> Areas of high and low visual impact can be mapped, using contour maps and sign lines from key viewing areas. Photographs from the air and from viewing areas can be used to identify situations and relate them accurately to locations on the ground.

These are still based on the recreational use of the area, not on preservative criteria. The importance of an aesthetically pleasing environment to the skier is not mentioned at all.

Case 2

The U.S. Forest Service has worked with the Mountain Bell Telephone company in "a concerted effort to make such facilities as microwave antenna towers and equipment buildings more compatible with their natural surroundings" (U.S.D.A.-Forest Service-Mountain Bell). Landscape architects and conservationists from the Forest Service are responsible for selecting sites where construction of necessary facilities can be adapted to the landscape. This is followed by a joint effort architectural design program to minimize impact on the terrain physically and visually. Visible features such as radio towers are designed to reflect the natural environment as much as possible. This requires detailed analysis of alternative design and construction methods for a facility, in an effort to minimize visual impacts at all stages. Special aids to construction may be needed (helicopters, to bring materials, manual rather than machine labor) in areas where the vehicles and machinery that would normally be used would harm the environment. Such approaches may be expensive and time consuming, and seem to be used more often when private as well as public agencies are involved in the project and costs may be shared.

REFERENCES

Section IV

Aesthetics Broadly Defined

Rudolf Arnheim, Visual Thinking, University of California Press, Berkeley, Calif., 1969 (p. 5).

Constance McLaughlin Green, The Rise of Urban America (Harper and Row, New York, 1967).

August Heckscher, "The Quality of American Culture", in Goals For Americans, The American Assembly, Columbia Univ. (Prentice Hall, Inc., 1968).

Dr. Ernest Klein, A Comprehensive Etymological Dictionary of the English Language, Vol. 1, p. 544 (Elsevier Pub. Co., N.Y., 1966).

Kevin Lynch, "The City as Environment," Cities (Alfred A. Knopf, Inc., N.Y., 1970).

Thomas Munro, Aesthetic Inquiry: Essays on Art Criticism and the Philosophy of Art, p. 43, Edited by Monroe C. Beardsley and Herbert M. Schueller (Dickenson Pub., Inc., Belmont, Calif., 1967).

Harold Osborne, Aesthetics and Art Theory, an Historical Introduction (E.P. Dutton & Co., Inc., N.Y., 1970).

Herbert Read, Art and Alienation, The Role of the Artist in Society, (The Viking Press, N.Y., 1969).

Joseph T. Shipley, Dictionary of Word Origins, p. 21 (The Philosophical Library, N.Y., 1945).

Frank Sibley, "Aesthetic Concepts," in Cyril Barrett (ed.), Collected Papers on Aesthetics (Barnes and Noble, N.Y., 1966).

Administrative and Statutory Aesthetic Concepts

"Aesthetic Nuisance: An Emerging Cause of Action," *New York University Law Review*, Vol. 45:1975 (November 1970).

Robert Broughton, "Aesthetics and Environmental Law: Decisions and Values," *Land and Water Law Review*, Vol. VII, No. 2 (1972).

Department of the Interior Guidelines to NEPA, F. R. Vol. 36, No. 192, pp. 19343-347 (Saturday, October 2, 1971).

Andrew F. Euston, Jr., "The Role of Design in HUD Programs," *HUD Challenge*, pp. 18-21 (December 1972).

Federal Highway Administration Guidelines to NEPA, F. R. Vol. 36, No. 239, pp. 23696-702 (Saturday, December 11, 1971).

The Federal Register, Vol. 38, No. 84, pp. 10856-10866 (Wednesday, May 2, 1973).

HUD Guidelines to NEPA, F. R. Vol. 37, No. 204, pp. 22673-677 (Friday, October 20, 1972).

Leighton L. Leighty, "Aesthetics As a Legal Basis for Environmental Control," *Wayne Law Review*, Vol. 17, No. 3 (July-August 1971).

The National Environmental Policy Act of 1969, Public Law 91-190, 83 Stat. 852-856.

United States Forest Service Guidelines to NEPA, F. R. Vol. 36, No. 239, pp. 23669-672 (Saturday, December 11, 1971).

Cases Cited by Broughton, Leighton, and New York University

Burke V. Smith
69 Michigan 380, 37 Northwest 838 (1888)

Parkersburg Builders Material Co., V. Barrack
118 West Virginia 608, 191 Southeast 368 (1937)

People V. Rubenfeld
215 New York 245, 172 Northeast 485, 486 (1930)

Berman V. Parker
348 United States 26 (1954)

Scenic Hudson Preservation Conference V. Federal Power Commission 345 F. 2nd 608 (2nd Cir. 1966)

Other Selected Readings

Archie J. Bahm, "Is a Universal Science of Aesthetics Possible?" Journal of Aesthetics and Art Criticism (Fall 1962).

S. J. Cyril Barrett, Collected Papers on Aesthetics (Barnes and Noble, New York, 1966).

S. H. Butcher, Aristotle's Theory of Poetry and Fine Art (Dover Publications, Inc., 1951).

M. Cohen and E. Nazel, An Introduction to Logic (Harcourt, Brace & World, Inc., New York, 1962).

John Dewey, Art as Experience (Putnam, New York, 1959).

Thomas Munro, Scientific Method in Aesthetics (W.W. Norton & Co. Inc., New York, 1928).

George Santayana, The Sense of Beauty, Bring the Outlines of Aesthetic Theory (Charles Scribners' Sons, New York, 1936).

Section V

The Use of Aesthetic Concepts in Applied Theory

Visual Analysis Methods

"Research Outlook, Planning Today for Tomorrow's Environment," Battelle Research Labs., Columbus Laboratories (November 2, 1972).

Ron S. Boster, "On the Criteria for and the Possibility of Quantifying the Aesthetic Aspects of Water Resource Projects," in Toward a Technique for Quantifying Aesthetic Quality of Water Resources, pp. 6-19, edited by Perry J. Brown (Utah State University, Logan, Utah, February 1973).

Herbert D. Burke, et al., "A Method for Classifying Scenery From a Roadway," reprinted from Park Practice Guideline (March 1968).

Norbert Dee et al., "Environmental Evaluation System for Water Resource Planning," Final Report to the Bureau of Recreation, U.S. Department of Interior, Prepared by Battelle-Columbus Laboratories, Columbus, Ohio (January 1972).

Gary H. Elsner, "Comparing Visible Areas From Proposed Recreation Developments...a Case Study," USDA Forest Service, Research Note PSW-246 (1971).

Julius Gy. Fabos, "An Analysis of Environmental Quality Ranking Systems," pp. 40-55 in Recreation Symposium Proceedings, Northeastern Forest Experimental Station, Forest Service, U.S. Department of Agriculture, Upper Darby, Pa. (1971).

Rolland B. Handley, "An Environmental Quality Rating System," Northeast Region Staff, Bureau of Outdoor Recreation (1973).

Henry A. Harrison, "Coordinator Problem--Dispersed Areas," paper presented at U.S. Forest Services Timber Management Recreation meeting, Bend, Oregon (July 16-20, 1962).

William W. Hill, "A Review of Selected Materials Relevant to Environmental Impact Assessment," Chapter 3, in Analyzing the Environmental Impacts of Water Projects, Leonard Ortalano (ed.), Institute for Water Resources Report 73-3, pp. 3-1 to 3-69 (March 1973).

Peter L. Hornbeck, et al., "Visual Values for Highway," Volume 1, a Resume of the Technical Report of the Same Name, study done for the Department of Transportation by Landscape Architecture Research Office, Harvard University, Cambridge, Massachusetts (September 1970).

Thomas M. Krauskopf and Dennis C. Bunde, "Evaluation of Environmental Impact Through a Computer Modelling Process," in R. B. Ditton and T. L. Goodale (eds.), Environmental Impact Analysis: Philosophy and Methods, University of Wisconsin, SEA Grant Publication, Madison, Wisconsin, pp. 107-125 (January 1972).

Luna Leopold, "Quantitative Comparison of Some Aesthetic Factors Among Rivers," U.S.G.S., Circular 620, Washington D.C. (1969).

Luna B. Leopold, et al., "A Procedure for Evaluating Environmental Impact, U.S.G.S., Circular 645, Washington, D.C. (1971).

Philip H. Lewis, Jr., "Quality Corridors for Wisconsin," Landscape Architecture, Vol. 54, No. 2, pp. 100-108 (January 1964).

R. Burton Litton, et al., "An Aesthetic Overview of the Role of Water in the Landscape," Prepared for the National Water Commission by the Department of Landscape Architecture, University of California, Berkeley (July 1971).

Ian L. McHarg, Design With Nature (Natural History Press, Doubleday & Company, Inc., Garden City, New York, 1969).

Dale D. Meredith and Ben B. Ewing, "Systems Approach to the Evaluation of Benefits from Improved Great Lakes Water Quality," Conference Proceedings, 1969: 843-870, International Association of Great Lakes Res.

Allen H. Miller and Bernard V. Niemann, "An Interstate Corridor Selection Process-The Application of Computer Technology to Highway Location Dynamics, Phase I," Environmental Awareness Center and the Department of Landscape Architecture, University of Wisconsin (1972).

Erwin Zube, et al., Research Planning and Design Associates, Inc., "Visual and Cultural Environment," Appendix N in North Atlantic Regional Water Resources Study for the N.A.R.W.R.S. Coordinating Committee (November 1970).

Other Readings Not Reviewed

Nicholas H. Coomber and Asit K. Biswas "Evaluation of Environmental Intangibles, Review of Techniques," Ecological System Branch, Research Coordination Directorate, Policy Planning, and Research Service, Canada (June 1972).

Kenneth H. Craik, "Appraising the Objectivity of Landscape Dimensions," in Material Environment, Studies in Theoretical and Applied Analysis, pp. 292-346, edited by John Krutilla (Resources for the Future, Inc. Johns Hopkins University Press, Baltimore, Maryland 1972).

Peter Jacobs and Douglas Way, Visual Analysis of Landscape Development. Landscape Architecture Research Office Harvard University, Cambridge, Massachusetts (1968).

Philip H. Lewis, Jr. and Assoc., "Upper Mississippi River Comprehensive Basin Study, Appendix B-Aesthetic and Cultural Values," Upper Mississippi River Basin Coordinating Committee (1969).

R. Burton Litton, Jr., *Forest Landscape Description and Inventories: a Basis for Planning and Design*, p. 171, Research Paper PSW-49, Pacific Forest and Range Experiment Station, U.S.D.A. Forest Service, Berkeley, California (1968).

"Monitoring the Environment of the Nation," prepared for the Council on Environmental Quality, Mitre Corp., McLean, Virginia (April 1971).

Marie Morisawa, "Evaluating Riverscapes," pp. 91-106, in D. R. Coates, Ed., *Environmental Geomorphology*, Proceedings of the First Annual Geomorphology Symposium Series, State University of New York, Binghamton, New York (1971).

J. J. Nightswanger, "A Methodology for Inventory Evaluation of the Scenic Quality and Related Recreational Value of Kansas Streams," Commerce Report #PB 199190 16-72-05645.

Carl Steinitz, Timothy Murray, David Sinton, and Douglas Way, *A Comparative Study of Resource Analysis Methods* Department of the Army, New England Division, Corps of Engineers, Waltham, Mass. (1969).

Carl Steinitz and Douglas Way, "A Model for Evaluating the Visual Consequences of Urbanization," in Steinitz, C., and P. Rogers, *Qualitative Values in Environmental Planning: A Study of Resource Use in Urbanizing Watersheds*. Office, Chief of Engineers, Department of the Army, Washington, D.C., 20314 (1969).

"Interstate Highway 84 in Rhode Island," (Vol. 2, Chapter 6, "Visual Quality"), Draft Environmental Impact Statement, Steinitz Rogers Associates Inc., for Department of Transportation, State of Rhode Island and Providence Plantations (May 1972).

Douglas Way and James Knode, "Visual Color Absorptive Levels in Typical Vegetative Associations," in Steinitz, C., and P. Rogers, *Qualitative Values in Environmental Planning: A Study of Resource Use in Urbanizing Watersheds*. Office, Chief of Engineers, Department of the Army, Washington, D.C., 20314 (1969).

User Analysis Methods

Donald Appleyard and Mark Lintell, "Environmental Quality of City Streets: The Residents Viewpoint," *Highway Research Record* #356 p. 170 (1971).

Ron S. Boster, "On the Criteria for and the Possibility of Quantifying the Aesthetic Aspects of Water Resource Projects," in Toward a Technique for Quantifying Aesthetic Quality of Water Resources, Edited by Perry J. Brown, Utah State University, Logan, Utah (February 1973).

Charles L. Jackson, "Scenic Resources, A Study of Scenic Preferences," Master of Science Professional Paper, Colorado State University Department of Recreation Resources, Fort Collins, Colorado (1972).

George L. Peterson and Edward S. Neumann, "Modeling and Predicting Human Response to the Visual Recreation Environment," Journal of Leisure Research, Vol. 1, No. 3 (Summer 1969).

Elwood L. Shafer, Jr. and James Mietz, "It Seems Possible to Quantify Scenic Beauty in Photographs," U.S.D.A. Forest Service Research Paper NE-162, Northeastern Forest Experiment Station, Upper Darby, Pennsylvania (1970).

Gary H. Winkel, "Community Response to the Design Features of Roads, A Technique for Measurement," Highway Research Record, No. 305 (1970).

Other Readings Not Reviewed

Donald Appleyard, "Styles and Methods of Structuring a City," Environment and Behavior, Vol. 2, No. 1, June 1970, pp. 100-17.

Donald Appleyard and Lois Fishman, "High Rise Buildings in San Francisco--The Political Conflict and Some Methods of Assessment," University of California at Berkeley (unpublished), 1973.

Donald Appleyard, Kevin Lynch and J. Myer, The View From the Road, (Massachusetts Institute of Technology Press, 1965).

Donald Appleyard, G. McKechnie, and H. Older, "Traveller Attitudes to the Highway Environment," unpublished paper dated 1971.

Tridib Banerjee and Kevin Lynch, "Research Guide for and International Comparative Study of the Impact of Economic Development on the Spatial Environment of Children," unpublished mimeo dated September 1971.

John Coller, Jr., Visual Anthropology: Photography as a Research Method, (Holt, Rinehart, and Winston, New York 1967).

Robert E. Coughlin and Karen A. Goldstein, "The Extent of Agreement Among Observers on Environmental Attractiveness," RSRI Discussion Paper, Series #37, Regional Science Research Institute, Philadelphia, Pa. (1970).

Edmond Costantini and Kenneth Huff, "Environmental Concern and Lake Tahoe: A Study of Elite Perceptions, Backgrounds, and Attitudes," Environment and Behavior, Vol. IV, No. 2, pp. 209-242 (June 1972).

Kenneth H. Craik, "The Comprehension of the Everyday Physical Environment," Journal of the American Institute of Planners, Vol. 34 (January 1968).

R. G. Hopkinson, "The Quantitative Assessment of Visual Intrusion," Journal of the Town Planning Institute, Vol. 7 #10 (1971).

Robert Kates, "The Pursuit of Beauty in the Environment," Landscape 16 (2), 21-24 (1966-67).

"Response to the Roadside Environment," A. D. Little, Inc., Outdoor Advertising Association of America (1968).

Lowenthal and Riel, "Publications in Environmental Perception," Nos. 1-8, American Geographic Society, New York (1972).

Kevin Lynch, The Image of the City (Massachusetts Institute of Technology Press, 1960).

Edward S. Neumann, "Evaluating Subjective Response to the Recreation Environment," (Ph.D. dissertion, Northwestern University, 1969).

George Peterson, "A Model of Preference: Quantitative Analysis of the Visual Appearance of Residential Neighborhoods," Journal of Regional Science (Summer 1967).

Carla B. Rabinowitz and Robert E. Coughlin, "Analysis of Landscape Characteristics Relevant to Preference," RSRI Discussion Paper, Series #38, Regional Science Research Institute, Philadelphia, Pa. (1970).

Van Der Ryn and Boie, "Value Measurement and Visual Factors in the Urban Environment," Mimeograph, College of Environmental Design, University of California, Berkeley (January 1963).

W. D. Wenger, Jr. and R. Videbeck, "Pupillary Response as a Measure of Aesthetic Reaction to Forest Scenes," State University of New York, Syracuse, New York, College of Forestry, Report No. 1, Project K (September 1968).

Wilson, "Livability of the City: Attitudes and Urban Development," in Chapin and Weiss, Eds., *Urban Growth Dynamics* (no date)

Joachim F. Wohlwill, "Amount of Stimulus Exploration and Preference as Differential Functions of Stimulus Complexity," *Perception and Psychophysics* 4(5): 307-312 (1968).

Aesthetics in Basic Research

Carl-Axel Acking, *The Perception of An Interior As A Function of Its Colour*, Section of Architecture Lund Institute of Technology, Lund, Sweden, 1969. (Translated 1970).

Carl-Axel Acking, "Translation of a Preliminary Research Report 20.12. 1967 Concerning Visual Perception of the Environment," Department of Theoretical and Applied Aesthetics, Section of Architecture, Lund Institute of Technology (1967).

Irwin Altman and William W. Haythorn, "The Ecology of Isolated Groups," *Behavioral Science*, Vol. 12, No 3 (May 1967).

Irwin Altman, "An Ecological Approach to the Functioning of Social Groups," paper presented at NATO symposium on Man in Isolation, Rome, Italy (October 1969).

Irwin Altman and Evelyn E. Lett, "The Ecology of Interpersonal Relationships: A Classification System and Conceptual Model," *Social and Psychological Factors in Stress* (Holt, Rinehart and Winston, New York, 1970).

Irwin Altman, "Territorial Behavior in Humans: An Analysis of the Concept," *Spacial Behavior of Older People* (The University of Michigan--Wayne State University Press, Michigan, 1970)

Irwin Altman, Dalmus A. Taylor, Ladd Wheeler, "Ecological Aspects of Group Behavior in Social Isolation," *Jour. of Applied Social Psychology* 1, 1 (1971).

Irwin Altman, Patricia A. Nelson, Evelyn E. Lett, "The Ecology of Home Environments," Final Report pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare (January 1972).

Irwin Altman, "Some Perspectives on the Study of Man-Environment Phenomena," *Representative Research in Social Psychology* *4*, 1, (1973).

Donald Appleyard, "City Design and the Pluralistic City," in Rodwin, *Regional Planning for Development* (Massachusetts Institute of Technology Press, 1969).

Donald Appleyard, "The Urban Environment: Selected Bibliography Supplement," (December 1972).

John Archea, "HUD International Information Sources Series," U.S. Department of Housing and Urban Development, Office of International Affairs (September 1971).

John Archea et al., "Socio-Physical Technology--A State of the Art Report," University of Pennsylvania (1971).

Rudolf Arnheim, *Visual Thinking* (University of California Press, Berkeley, California, 1969).

Rudolf Arnheim, *Toward a Psychology of Art* (University of California Press, Berkeley, California, 1966).

Rudolf Arnheim, *Art and Visual Perception* (University of California Press, Berkeley, California, 1964).

Raymon A. Bauer, Editor, *Social Indicators* (Massachusetts Institute of Technology Press, 1966).

Robert B. Bechtel, "Societal Goals Through Design: A Half Process That Needs to be Made Whole," paper delivered at The American Institute of Planners Conference, Boston, Massachusetts (October 9, 1972).

Clive Bell, *Art* (Chatto and Windus, London, 1916).

Gwen Bell and Paula MacGreevey, "Behavior and Environment: A Bibliography of Social Activities in Urban Space," Council of Planning Librarians, Monticello, Illinois (April 1970).

Robert D. Campbell, Lawrence Schlesinger, Betty Jane Schuchman, "Planning the Man-Environment Interaction," Matrix Research Corporation, Alexandria, Virginia (April 30, 1970).

F. Stuart Chapin, Jr., Urban Land Use Planning (University of Illinois Press, 1965).

Sidney Cohn, Optimizing the Man-Made Environment, Department of City and Regional Planning, University of North Carolina, Chapel Hill, N.C., May 8, 1970.

Kenneth H. Craik, "Environmental Psychology--References," New Directions in Psychology, 4, Theodore M. Newcomb Ed. (Holt, Rinehart, and Winston, 1970).

R. J. Drechsler, "Affect-stimulating Effect of Colors," Journal of Abnormal and Social Psychology, Vol. 61, No. 3, pp. 323-328, 1960.

"The 'Quality of Life' Concept," Environmental Protection Agency, Symposium held August 29, 30 and 31 at Arlie House, Warrenton, Virginia (1972).

"A Review of State-of-the-Art and Guidelines Derived to Assist in Developing Environmental Indicators," Environmental Protection Agency, Summary Report (August 1972).

Land Use and the Environment, An Anthology of Readings, Environmental Protection Agency, Washington, D.C., (1973).

Leon Festinger, A Theory of Cognitive Dissonance (Stanford University Press, Stanford, California, 1965).

James Marston Fitch, "7 Experiential Bases for Aesthetic Decision," in Harold M. Proshansky, William H. Ittelson, Leanne G. Rivlin, Environmental Psychology--Man And His Physical Setting (Holt, Rinehart and Winston, Inc., 1970).

Barbara Ford, "The Federal Government in Man-Environment Research," Design and Environment (Summer 1971).

Herbert J. Gans, "Planning and Social Life: Friendship and Neighbor Relations in Suburban Communities," Journal of the American Institute of Planners, Vol. 27, No. 2 (May 1961).

James J. Gibson, The Senses Considered as Perceptual Systems (Houghton-Mifflin, Boston, Massachusetts, 1966).

James J. Gibson, *Perception of the Visual World* (Houghton-Mifflin Boston, Massachusetts, 1950).

Mark Heyman, "Space and Behavior: A Selected Bibliography," *Landscape*, 13, pp. 4-10

Kenneth E. Hornbeck and Robert W. Shaw, Jr., "Toward a Quantitative Measure of the Quality of Life," Report on a study conducted under a grant contract from EPA (Summer 1972).

Peter W. House, "How Do You Know Where You Are Going (Measuring the Quality of Life," paper presented at a seminar on Multiple Criteria Decision Making, University of South Carolina (October 26 and 27, 1972).

Hans Huth, "The Aesthetic Emphasis," (1948) in Roderick Nash. Ed., *Environment and Americans--The Problem of Priorities* (Holt, Rinehart and Winston, 1972).

Hugh H. Iltis, "The Meaning of Human Evolution to Conservation," *Wisconsin Academy Review*, 13(2) (Spring 1966).

Hugh H. Iltis, "The Optimum Human Environment and its Relation to Modern Agricultural Preoccupations," *The Biologist*, Vol. L., No. 34. (June 1968).

Hugh H. Iltis, "Corn and Cows Are Not Enough! The Uses of Diversity," First National Congress on Optimum Population and Environment, Chicago (June 1970).

Alan Jacobs et al., San Francisco Department of City Planning, *The Urban Design Plan*, May 1971, and *Preliminary Report No. 4: Existing Form and Image*, San Francisco (1970).

John V. Krutilla, Ed., *Natural Environments--Studies in Theoretical and Applied Analysis* (Johns Hopkins University Press, Baltimore, Maryland, 1972).

The Forest Symposium, E. vH. Larson, Ed., USDA, Northeastern Forest Experiment Station, Pennsylvania (1971)

LeCorbusier, *The Radiant City* (The Orton Press, New York, 1933).

Aldo Leopold, *A Sand County Almanac with Essays on Conservation from Round River* (Oxford University Press, Inc., 1949).

V. Lowenfeld, The Nature of Creative Activity (Kegan Paul, London, 1939).

David Lowenthal, "Bibliography on Environmental Perception," American Geographical Society, New York City (no date).

David Lowenthal, "Not Every Prospect Pleases: What Is Our Criteria for Scenic Beauty," Landscape, Vol. 12:1, pp 19-23 (1962-63).

Charles C. Lozar "A Methodological Investigation of the Use of the Semantic Differential and Timelapse Photography to Measure Attitude and Behavior in a Military Dining Hall at Chanute AFB," Dept. of the Army, Construction Engineering Research Lab., Champaign, Illinois (January 1973).

Charles C. Lozar, "Initial Report on the Survey of Occupant-Environment Interaction Measurement Techniques to Identify and Relate Behavioral and Physical Design Parameters," Department of the Army, Construction Engineering Research Lab., Champaign, Illinois (February 1973).

Kevin Lynch, "City Design and City Appearance," in William J. Goodman, Ed., Principles and Practice of Urban Planning, Washington, D.C. (1968).

Kevin Lynch, "A Selected Bibliography on the Sensous Form of the Large-Scale Environment," The Urban Landscape (Spring 1973).

Ian McHarg, Design With Nature (Doubleday/Natural History Press, 1969).

W. Michelson, Man and His Urban Environment: A Sociological Approach, (Addison-Wesley Press, 1970).

William Michelson, "A Selected Bibliography of Writings on the Social Aspects of the Urban Physical Environment," University of Toronto (no date).

Lewis Mumford, The Urban Prospect (Harcourt, Brace & World, Inc., New York, 1956).

Roderick Nash (Ed.), Environment and Americans--The Problem of Priorities (Holt, Rinehart and Winston, 1972).

"Experimental R&D Incentives Program Background Study on Social Indicators," New World Systems, Inc., prepared in accordance with National Science Foundation Contract No. 72-744 (July 1972).

Rai Okamoto and David Liskamm, Appearance and Design--Principles for the Design and Development of San Francisco Bay, September 1967.

Leon A. Pastalan "Environment and Behavior: A Bibliography," unpublished, (under grant from the Educational Facilities Laboratories).

George L. Peterson, "A Model of Preferences: Quantitative Analysis of the Perception of the Visual Appearance of Residential Neighborhoods," Journal of Regional Science, Vol. 7, No. 1.(1967).

R. W. Pickford, Psychology and Visual Aesthetics (Hutchinson Education Ltd., London, 1972).

Wolfgang F. E. Preiser, "Behavioral Design Criteria in Student Housing--The Measure of Verbalized Response to Physical Environment," Research Report Series No. 1, Environmental Systems Laboratories, College of Architecture, Virginia Polytechnic Institute (1969).

Harold M. Proshansky, William H. Ittleson, Leanne G. Rivlin, Environmental Psychology--Man and His Physical Setting (Holt, Rinehart and Winston, Inc., New York, 1970).

Amos Rapoport, "Observations Regarding Man-Environment Studies-- Bibliography," Man-Environment Systems, P-1 (January 1970).

Jesse Reichek, "On The Design of Cities," Journal of the American Institute of Planners, Vol. 27, No. 2 (May 1961).

Irving Rosow, "The Social Effects of the Physical Environment," Journal of the American Institute of Planning, Vol. 27, No. 2 (May 1961).

Thomas F. Saarinen, "Perception of Environment," Association of American Geographers, Washington, D.C. (1969).

B. J. Sabaroff "The Bio-Psychosociological Effects of the Environment on Man: An Analysis of Currently Available Information," National Bureau of Standards (April 1966).

Henry Sanoff, "Social Implications of the Physical Environment with Particular Emphasis on Housing and Neighborhood Characteristics: A Bibliography," Council of Planning Librarians, Monticello, Illinois (August 1970).

Paolo Soleri, "The City in the Image," (Massachusetts Institute of Technology, Cambridge, Mass., 1969).

Mayer Spivack, "Bibliography: Physical Environment and Behavior," Laboratory of Community Psychiatry, Harvard Medical School (no date).

Toward Master Social Indicators, Stanford Research Institute, paper prepared under grant from U.S. Office of Education, Menlo Park, California (February 1969).

Svenson, "Differential Perception and Behavioral Response to Change in Urban Spacial Form," Ph.D. Thesis, Massachusetts Institute of Technology (1967).

Wilson, "Livability of the City: Attitudes and Urban Development," in *Urban Growth Dynamics*, Chapin & Weiss, Ed. (no date).

Gary H. Winkel, Roger Malek, Philip Thiel, "The Role of Personality Differences in Judgments of Roadside Quality," *Environment and Behavior*, Vol. 1, No. 2 (December 1969).

J. Wohlwill and D. Carson, Eds., *Environment and the Social Sciences: Perspectives and Applications*, American Psychological Assn. (1972).

M. R. Wolfe and R. D. Shinn, "Urban Design Within the Comprehensive Planning Process," University of Washington, Department of Urban Planning (April 1970).

Steven Zlutnick and Irwin Altman, "Crowding and Human Behavior," (supported in part by a grant from the Office of Education, Department of Health, Education and Welfare), University of Utah (no date).

Proceedings of the Second Annual Workshop on Socio-Physical Technology, November 1968, The American Institute of Architects (1970).

Section VI

Howard Bloomfield, "Quest for Quality: An Interview with Forest Service Chief John R. McGuire," *American Forests* (October 1972).

California Action Plan for Transportation Planning, Final Draft, (unapproved), California Department of Transportation (June 1973).

Ivan Chermayeff et al., *The Design Necessity* (Massachusetts Institute of Technology Press 1973).

California Environmental Quality Act of 1970, Public Resources Code, Division 13, Sections 21000-21174.

"Background Material on Environmental Quality and Natural Resources," Job 2900, Comprehensive Planning Organization, San Diego (January 1972).

"Policies and Recommendations for Determining Regional Significance and Prematurity of Development," Comprehensive Planning Organization, R-5, San Diego (February 1973).

"The Regional Model System and the Planning/Decision Making Process: A Non-Technical Description," Comprehensive Planning Organization, San Diego (April 1972).

"Summary of Findings and Recommendations, Coastal Area Planning and Management Policies," Initial Coastline Study and Plan, Comprehensive Planning Organization, Job Number 4901, San Diego County (June 1973).

"Working Paper: Coastal Vistas," Initial Coastline Study and Plan, Comprehensive Planning Organization, Job Number 4901, San Diego County (December 1972).

"Goals and Objectives for the San Diego Region," Comprehensive Planning Organization, Regional Goals Committee, San Diego (November 1972).

"Public Buildings and Space," General Services Administration, ADM P 1000.2B CHGE 1, Washington, D.C. (May 1, 1973).

Jacobs and Way, "A Systems Analysis Model of Urbanization and Change," in Steinitz and Rogers, MIT Report 20 (1970).

Boris Kachura, "Development of the PBS Environmental Assessment Procedure: Status Report," Public Buildings Service, General Services Administration, Washington, D.C. (July 19, 1973).

Shiraz Kaderali, "A Visual Analysis Model," Pacific Gas and Electric Company, San Francisco (November 1972).

Marilyn W. Klein, "Highway Research Board Environmental Workshop, National Academy of Sciences, July 7-9, 1971," Department of Transportation Memorandum TEU-12, Washington, D.C. (July 28, 1971).

Marilyn W. Klein, "Participation in Environmental Guidelines Committee, Pursuant to Section 136b of the 1970 Highway Act, Aesthetics Team," Department of Transportation Memorandum TEU-12 (May 27, 1971).

Jon A. Kusler, Farnum Alston, "Environmental Impact Evaluation Procedures, Some Recommendations for Wisconsin," University of Wisconsin, Institute for Environmental Studies, Madison, Wisc. (December 1972).

Robert C. Lucas, "The Challenge and the Response to Forest Service Wilderness Management in the Rockies," *Naturalist* (Minneapolis), Vol. 22, No. 3 (1971).

Kevin Lynch, Sasaki, Dawson & Demay Associates, Inc., "Looking at The Vineyard," Vineyard Open Land Foundation, Martha's Vineyard (1973).

Marvin L. Manheim, *Reaching Decisions about Technological Projects with Social Consequences: A Normative Model* (Elsevier Scientific Publishing Company, Amsterdam, 1973).

Marvin L. Manheim, "Report to Congress on Section 109(h), Title 23, U.S. Code--Guidelines Relating to the Economic, Social and Environmental Effects of Highway Projects" (August 1972).

"Regional Transportation Plan for the San Francisco Bay Area," Metropolitan Transportation Commission (June 1, 1973).

"The National Environmental Policy Act of 1969," Public Law 91-190, January 1, 1970.

"National Foundation on the Arts and the Humanities Act of 1965," Public Law 209--89th Congress, as amended through July 20, 1970.

"Criteria for Selecting Consultants," National Park Service, Denver Service Center (April 1973).

"Planning and Design Process," National Park Service, Denver Service Center (April 1973).

"Planning and Design Standards," National Park Service, Denver Service Center (April 1973).

Martin J. Redding, "Guidelines for Incorporating Factors of Aesthetic and Visual Impact into the Planning Process of Transportation Systems," U.S. Department of Transportation (August 1971).

Environmental Impact Report Procedural Ordinance, City of San Diego, Ordinance No. 10952, November 24, 1972, amended by Emergency Ordinance No. 10961, December 22, 1972.

"Guidelines for Implementation of California Environmental Quality Act and for Processing Environmental Impact Reports and Negative Declarations," City of San Diego Environmental Quality Department, San Diego (March 1973).

"Issues San Diego," City of San Diego Planning Department, San Diego (1972).

"City of San Francisco, Environmental Quality, San Francisco Administrative Code, Chapter 13 (Draft)," (February 22, 1973).

"San Francisco Urban Design Study Preliminary Report #7," San Francisco Department of City Planning, San Francisco (October 1970).

"The Urban Design Plan of the Comprehensive Plan of San Francisco," San Francisco Department of City Planning, San Francisco (May 1971).

"Action Plan," U.S. Department of Agriculture-Forest Service (June 1972).

"National Forest Landscape Management," Volume I, U.S. Department of Agriculture Forest Service (February 1973).

"Visual Resource Management Guides, Visual Quality Standard Determination and Application," U.S. Department of Agriculture Forest Service, Californi[illegible] Region (March 1973).

"Forest Landscape Management," Volume I, U.S. Department of Agriculture Forest Service, Northern Region (February 1973).

"Order on Procedures for Considering Environmental Impacts," U.S. Department of Transportation, Memorandum 5610.1A (no date).

"Process Guidelines (Economic, Social and Environmental Effects on Highway Projects)," U.S. Department of Transportation, Federal Highway Administration, Policy and Procedure Memorandum 90-4 (September 21, 1972).

State of Wisconsin, Environmental Quality--Governmental Consideration, Assembly Bill 875, Chapter 274, Laws of 1971.

Appendix

Benjamin O. Davis, "Proposed Final Environmental Impact Statement and Section 4(f) Determination--I-70 (Glenwood Canyon/Cottonwood Pass)," U.S. Department of Transportation Memorandum TES-70 (March 12, 1973).

Larry Isaacson, Barry L. Peterson, *Park and Recreation Facilities*, U.S. Department of Transportation, U.S. Government Printing Office, Washington, D.C. (March 1971).

"Northwest Colorado Radio System," U.S.D.A. Forest Service, Mountain Bell (informational pamphlet, no date).

"Planning Considerations for Winter Sports Resort Development," U.S.D.A. Forest Service, National Ski Areas Association (1973).

Highway Joint Development and Multiple Use, U.S. Department of Transportation, Environmental Development Division, U.S. Government Printing Office, Washington, D.C. (February 1970).

☆U.S. GOVERNMENT PRINTING OFFICE:1973 546-313/170 1-3